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**CARBONIFEROUS FAUNA
OF THE
SOUTH NAHANNI RIVER AREA**

W.J.H.PATTON

1954

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Abstract

In the latter part of August 1953, fossils were collected from a thick section of Carboniferous rocks exposed in the Mackenzie Mountains near South Nahanni River, Northwest Territories.

Corals, bryozoans, brachiopods, mollusks, blastoids, trilobites and fossil plants were found.

Brachiopods were the most abundant fossils in the collection and constitute the major portion of the study. Twenty-four genera were recognized. Twenty-seven species were identified on which correlations with other sections are based. Eleven different forms were described but not named.

One gastropod, two pelecypods, a blastoid and three plant fossils were also described.

Corals and bryozoans were not described but are included in a faunal list.

Mississippian rocks of Kinderhook, Osage, Meramac and Chester ages are indicated from fossils identified.

A correlation with the southern Mississippian section of the Canadian Rockies has been made. The Banff formation is lithologically the same as in the southern section but beds equivalent in age to the Rundle formation consist of sandstones or argillaceous limestones and calcareous shales.

The sandstones equivalent in age to a large part of the Rundle formation are ripple marked and cross bedded and contain fossil plants Stigmaria and Lepidodendron which indicate the shore line of the upper Mississippian sea was not far from the South Nahanni Area. The name "Greenock" has been used for these sandstones since this name has been used previously by Brown (1952) at Jasper for upper Mississippian sandstones.



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THE UNIVERSITY OF ALBERTA

CARBONIFEROUS FAUNA
OF THE
SOUTH NAHANNI RIVER AREA

A DISSERTATION
SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE
OF MASTER OF SCIENCE

FACULTY OF ARTS AND SCIENCE
DEPARTMENT OF GEOLOGY

by
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EDMONTON, ALBERTA

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I am grateful also to Mr. S. Magee for his help in the photographing of the fossils. Photographs of the section were taken by Mr. R. Krausert, and the originals are the property of Canadian Gulf Oil Company.

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Chapter 1

Introduction

INTRODUCTION

Preface

Carboniferous rocks have been known to be present in the vicinity of Liard River since 1889 when they were first reported by McConnell. In later years, other outcrops of Carboniferous rocks were found west of Liard River in the Mackenzie Mountains, and along South Nahanni River. Most of the outcrops are scattered and the relationship ^{among} ~~between~~ them ^{are} ~~is~~ not known.

A thick section of Carboniferous rocks is exposed near South Nahanni River. From a study of fossils from this section, a complete sequence of Mississippian rocks is believed to be present with the exception of a few of the uppermost beds.

Field Work

During the latter part of August of the 1953 field season, a collection of Carboniferous fossils was made by a Canadian Gulf Oil Company field party just west of Jackfish River in the Mackenzie Mountains, south of South Nahanni River. The location of the section is $123^{\circ} 59'$ west longitude and $61^{\circ} 06'$ north latitude.

The party members were Russ. Krausert and the writer. Jonas Marcette, of Nahanni Butte, was the willing cook. Dr. W. Weigmuller and Nick Federko helped in the collection of fossils from the uppermost sandstones of the section.

Access to the section was gained by helicopter after two previous attempts to reach the section by walking in

from the South Nahanni River failed, due to the brule of the upland and narrowing of Jackfish River valley to the point where travelling was prohibited any farther along the stream.

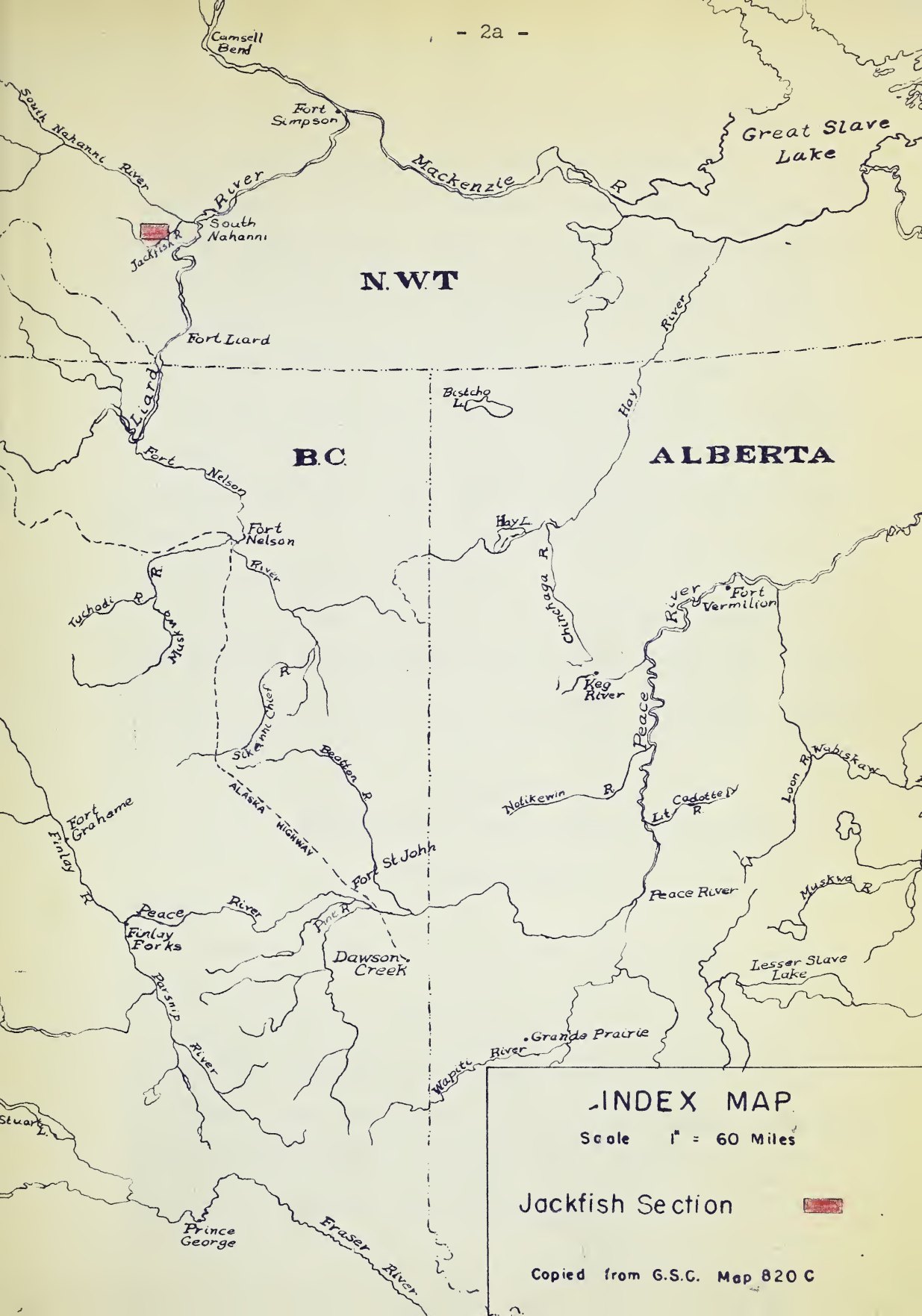
Previous Work

The first evidence of Carboniferous rocks in the vicinity of Liard River is from a report of exploration in 1887 by R.G. McConnell (1889). From an outcrop twelve miles below Fort Liard, McConnell reported the presence of rocks of probable Waverly age.

Later, in 1922, from similar outcrops along the Liard River and to the west of the Liard in the Mackenzie Mountains, Hume (1923) reported a Kinderhook and Fern Glen or Lower Burlington fauna.

Kindle (1944) found Permian and possibly upper Carboniferous fossils from Mount Merrill on Beaver River, a western tributary of the Liard.

The next year, 1945, Hage (1945) made a reconnaissance of the lower Liard River and collected fossils from previously known outcrops as well as from several mountains of the La Biche Range to the west of Liard River. He also reported Carboniferous rocks from Bluefish Mountain on the South Nahanni River. From fossils collected he indicated beds correlative with the Banff and Rundle formations. Rocks of possible Pennsylvanian age were also reported by him.



INDEX MAP

Scale 1" = 60 Miles

Jackfish Section



Copied from G.S.C. Map 820 C

Farther west and south, Hage (1944), Lord (1944) and Williams (1944) in 1944 examined outcrops of Carboniferous rocks along the Alaska Highway at various points between Fort St. John, Fort Nelson, Watson Lake and Teslin River in Northeastern British Columbia and Yukon Territory.

Laudon (1947) in 1946, re-studied the section found by Williams (1944) on Tetsa River and denied the presence of Osage rocks indicated by Williams. In the same article, Laudon asserts that Hume (1923) was probably wrong in his identification of fossils from Liard River and that no Osage rocks occur in the area.

Laudon (1948) in a later article, states that an unconformity exists between rocks of Kinderhook and Meramec ages and that no Osage rocks are present in Western Canada.

Chapter 2

DESCRIPTION OF CARBONIFEROUS FORMATIONS

Banff Formation

Author

McConnell, 1887, emend., Kindle, 1924, Shimer, 1926, Warren, 1937.

Originally named "Lower Banff Shales" by McConnell and changed to "Banff Shales" by Kindle and to "Banff Formation" by Shimer. The basal black, non-calcareous shales originally included were named the "Exshaw formation" by Warren and included in the upper Devonian.

Type Locality

Bow Valley, Banff, Alberta.

Lithology

The Banff formation as developed in the Jackfish River section consists of black fissile shales grading into calcareous shales which in turn grade into argillaceous limestones interbedded with shales. The limestones vary from a few inches to fifteen feet in thickness. The thickness including 440 feet of black fissile shales at the base which may belong to the Exshaw formation, is 1150 feet.

Field Relations

The Banff formation overlies thinly bedded argillaceous sandstones and siltstones which are probably Devonian in age. The boundary between the Banff and the overlying Rundle formations has been drawn on the basis of the last occurrence of Spirifer albertensis Warren and Spirifer grimesi Hall, because there is no distinct lithologic break.

Rundle Formation

Author

E.M. Kindle, 1924.

Type Locality

Mount Rundle, Banff, Alberta. ,

Lithology

The beds which are referred to the Rundle formation consist of interbedded argillaceous limestones and calcareous shales. The limestone beds are generally less than ten feet thick and only one massive bed fifty-one feet in thickness, of crinoidal limestone, is present.

Two zones of thinly bedded sandstones and shales occur in the formation. A few thin dolomite beds were found near the contact with the overlying sandstones. Chert nodules occur in some of the dolomite and limestone beds but are uncommon.

Since the lithology does not correspond to that of the Rundle formation as described at the type section, perhaps the name "Rundle" should not be used and these beds should be referred to the Banff formation.

The name "Rundle" is used, however, to indicate beds which occupy a similar stratigraphic position as massive limestone beds that overly the Banff formation at the type section.

The thickness of the beds assigned to the Rundle formation is 930 feet.

Field Relations

The Rundle formation overlies the Banff formation. The lower boundary is not lithologically distinct but based on fossil evidence. The upper boundary with massive sandstone beds is sharply defined although a few sandstone beds occur in the shales of the Rundle formation near the boundary.

"Greenock" Formation

Author

Brown, 1952.

Type Locality

South west spur of Mount Greenock, Jasper Park, Alberta.

Lithology

The upper member of the Greenock consists of quartzitic sandstones at the type section. The beds referred to the "Greenock" formation at Jackfish River are almost entirely of quartzitic sandstones, remarkably uniform throughout. The beds are generally massive, although several thinly bedded zones are present. A thin coal seam four feet thick occurs in the lower part of the formation. Black carbonaceous plant remains are common and cross bedding and ripple marks occur frequently.

The total thickness is 3730 feet, including 280 feet at the top of the section of unknown age but of similar lithology.

Field Relations

The name "Greenock" formation has been tentatively used for sandstones overlying the argillaceous limestone and calcareous shale sequence rather than introducing a new name.

The sandstones of the upper Greenock formation at the type section are much thinner (93 feet) than at Jackfish River. Brown (1952) reports Spirifer cf. pellaensis Weller from the Greenock formation which also occurs in the sandstones of the Jackfish River section.

The "Greenock" as used here, includes a thick series of sandstones equivalent in age to a large part of Rundle formation, since Rundle fossils occur in the sandstones.

The name "Greenock" formation may prove unsatisfactory for the sandstone facies occurring in Upper Mississippian time in the area as the extent of the sandstone southward is not known. Further work in the intervening area between the type section at Jasper and South Nahanni River will prove whether a new name is needed for sandstones occurring in the Upper Mississippian of this area.

Structure

The Mackenzie Mountains are generally of an anticlinal nature. Hage (1945) has shown the trends of several anticlinal axes in the vicinity of South Nahanni River in the Liard and La Biche Ranges of the Mackenzies.

The Carboniferous section near Jackfish River is exposed in a valley cutting transversely across the eastern limb of a north-easterly trending breached anticline of the La Biche Range.

(See Location Map Page 8a)

The eastern limb of the anticline forms a mountain range immediately west of Jackfish River. The beds dip south-easterly toward Jackfish River, which flows northward in a synclinal area between the Liard and La Biche Ranges as shown on Hage's (1945) map.

The strike of the beds in the section is 40° east of north and dip from 27° to 30° south east.

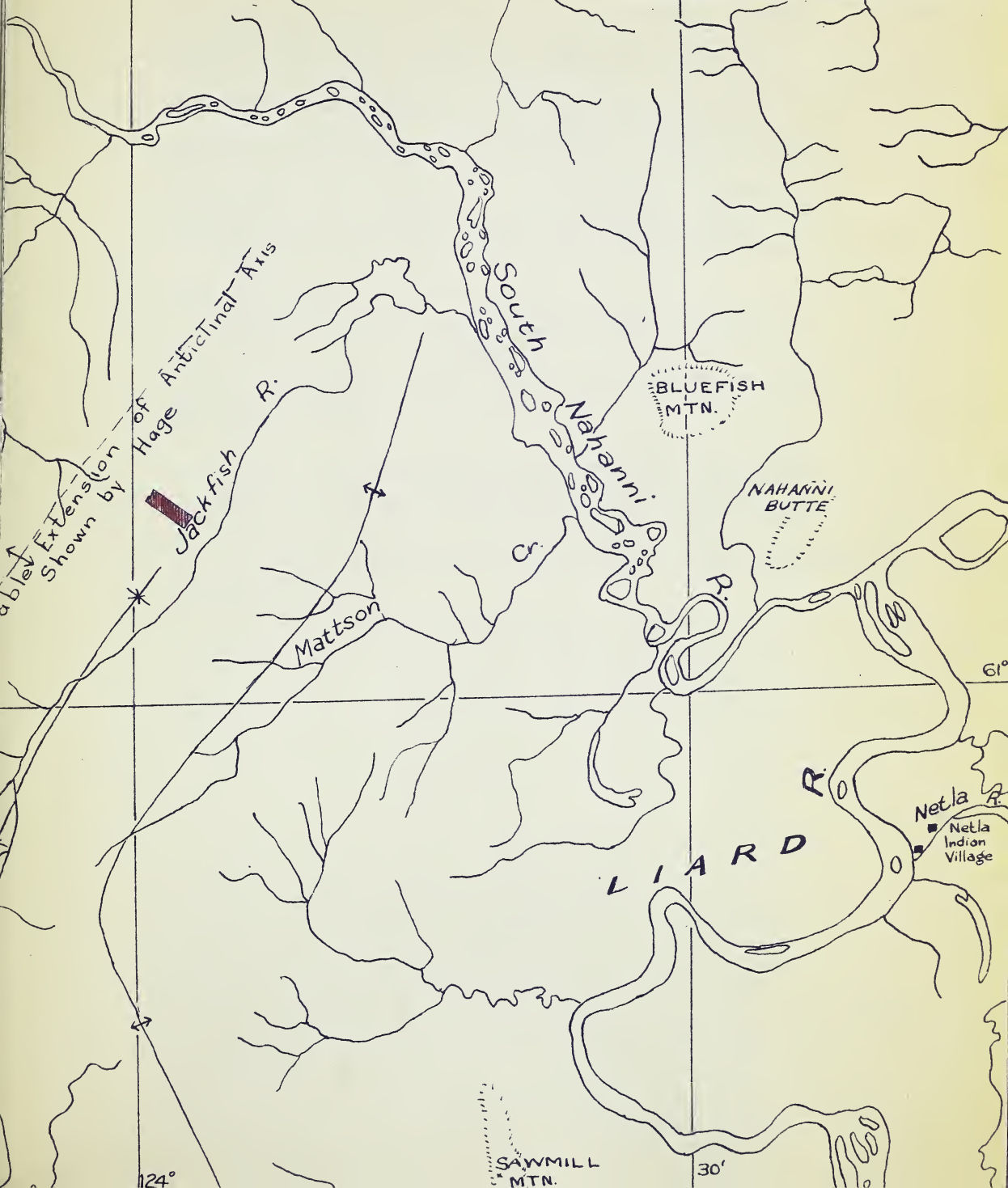
LOCATION MAP

Carboniferous
Jackfish

Section
River

Scale 1" = 4 Miles

Hage C.O. G.S.C. Paper 45-22



General Description of the Section

The section was measured from bottom to top using a five foot staff and a Brunton compass. The strata ~~is~~^{are} generally well exposed and few covered intervals were encountered, except in the upper part of the section where gullies extending up the mountains and filled with loose debris, cut into the beds.

The lithologic types present are similar to those described by Hage ⁽¹⁹⁴⁵⁾ in a reconnaissance along the Liard River.

Only a general description of lithology can be given by request of Canadian Gulf Oil Company who are permitting use of fossil collections from the Jackfish Section.

Top of Section

Dip slope of sandstone covered by vegetation

GREENOCK FORMATION

Sandstone, fine to medium grained, white to light yellowish grey on fresh surface, weathering yellowish buff, remarkably consistent throughout. Ripple marks and crossbedding common. Massive beds of sandstone are separated by more thinly bedded sandstones and carbonaceous shales. Intervals of 200 to 300 feet of clean yellowish light grey sandstone are common. Several large gullies occur in this interval, in which the beds are covered. 1430'

Siltstone, black argillaceous, containing wavy bands and nodules of grey chert. Silicified fossils. 2'

Dolomite, finely crystalline, grey 3'

Sandstone, fine to medium grained, slightly dolomitic, light yellow, weathering dark brown to yellowish grey, contains silicified fossils. 25'

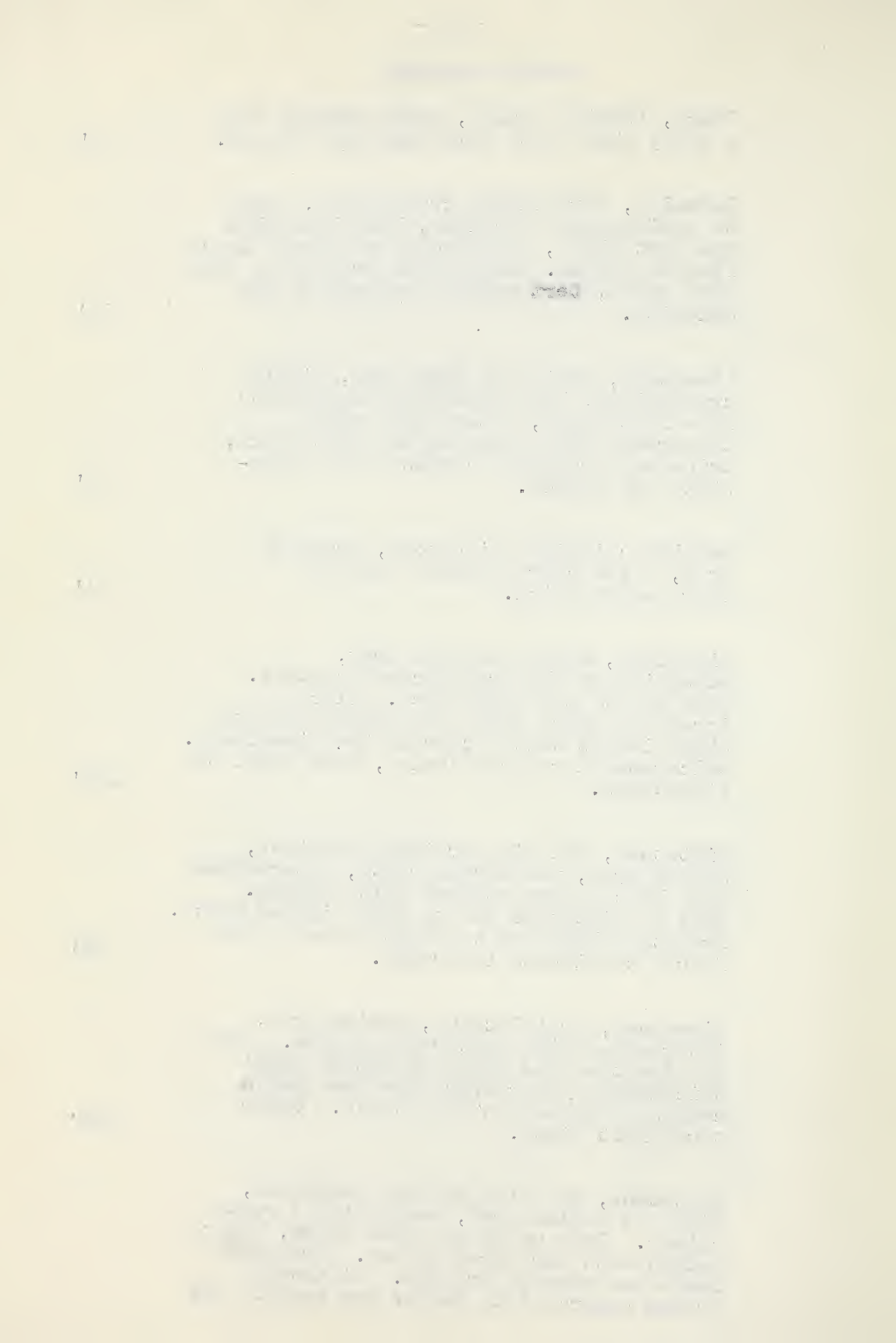
Sandstone, fine to medium grained, massive, beds cyclic with thinner beds of argillaceous sandstone and shales. Crossbedding and ripple marks common. Black carbon streaks of plant remains stand out in strong colour contrast to the lighter yellowish coloured sandstone in hand specimens. 1622'

Coal 4'

Sandstone, fine to medium grained, light yellow, weathering to yellowish buff. Beds massive often over 50 feet thick. Cliff faces show large conchoidal fractures 10 to 20 feet in diameter. Crossbedding and ripple marks common. Black carbonaceous plant remains fairly common. 648'

RUNDLE FORMATION

- Black, fissile shales, grade upwards into a silty shale with thin sandstone lenses. 4'
- Dolomite, very finely crystalline, light to medium grey in colour, beds less than one foot thick, interbedded with soft black fissile shales. Shale beds are two to five feet thick, Chert nodules present in the dolomite. 36'
- Limestone, medium to dark grey, finely crystalline, beds less than one foot to five feet thick, interbedded with calcareous shales one to two feet thick, Crinoidal fragments common in the limestone and shales. 70'
- Massive crinoidal limestone, brownish grey, a few chert nodules three to four inches thick. 51'
- Limestone, medium to dark grey, depending on the argillaceous content. Beds one to two feet thick. Black irregular chert bands and nodules six to eight inches thick occur in the limestones. Calcareous dark grey shales, beds equal to limestones. 225'
- Siltstone, and fine grained sandstone, medium grey, weathering rusty, interbedded with black rusty stained silty shales. Beds of siltstone one to eight inches thick. Ironstone bands up to eight inches thick fairly continuous laterally. 62'
- Limestone, argillaceous, medium grey, interbedded with calcareous shales. Beds of limestone and shale of almost equal thicknesses never over five feet and commonly one to two feet thick. Upper three feet silty. 200'
- Siltstone, and fine grained sandstone, light to medium grey, weathering a rusty colour. Beds up to two feet thick, interbedded with dark grey shales. Ironstone bands and nodules present. Siltstone grades upwards into shales and back to the



calcareous sequence of argillaceous limestone and shales.

20'

Cyclic bands of black argillaceous limestones and calcareous shales. Limestone beds from a few inches to fifteen feet thick. Contacts of calcareous shale and argillaceous limestone variable, sharp and transitional. Black, irregular chert nodules occur in the thicker beds occasionally.

265'

BANFF FORMATION

Limestone, dark grey, interbedded with calcareous shales. Limestone beds are often nodular and vary in thickness. Crinoid columnals are common.

470'

Shale, grey, calcareous, grades into argillaceous, finely crystalline dark grey to blackls. Beds variable in thickness, two to three feet, interbedded with calcareous shale.

10'

Shale, calcareous, dark grey to black

223'

Shale, black, fissile, grades to medium grey, calcareous shale.

10'

Shale, black fissile, ironstone, nodules and bands with pyrite cores.

436'

Covered or inaccessible

200'

Siltstone or fine grain sandstone, micaceous light grey to medium grey in colour, interbedded with black shales with ironstone nodules. Sandstone beds seldom over two feet thick, usually thinly bedded one to two inches thick, platy. Some black carbonaceous plant remains.

514'

Base of section covered by flat platy sandstone rubble.

0'

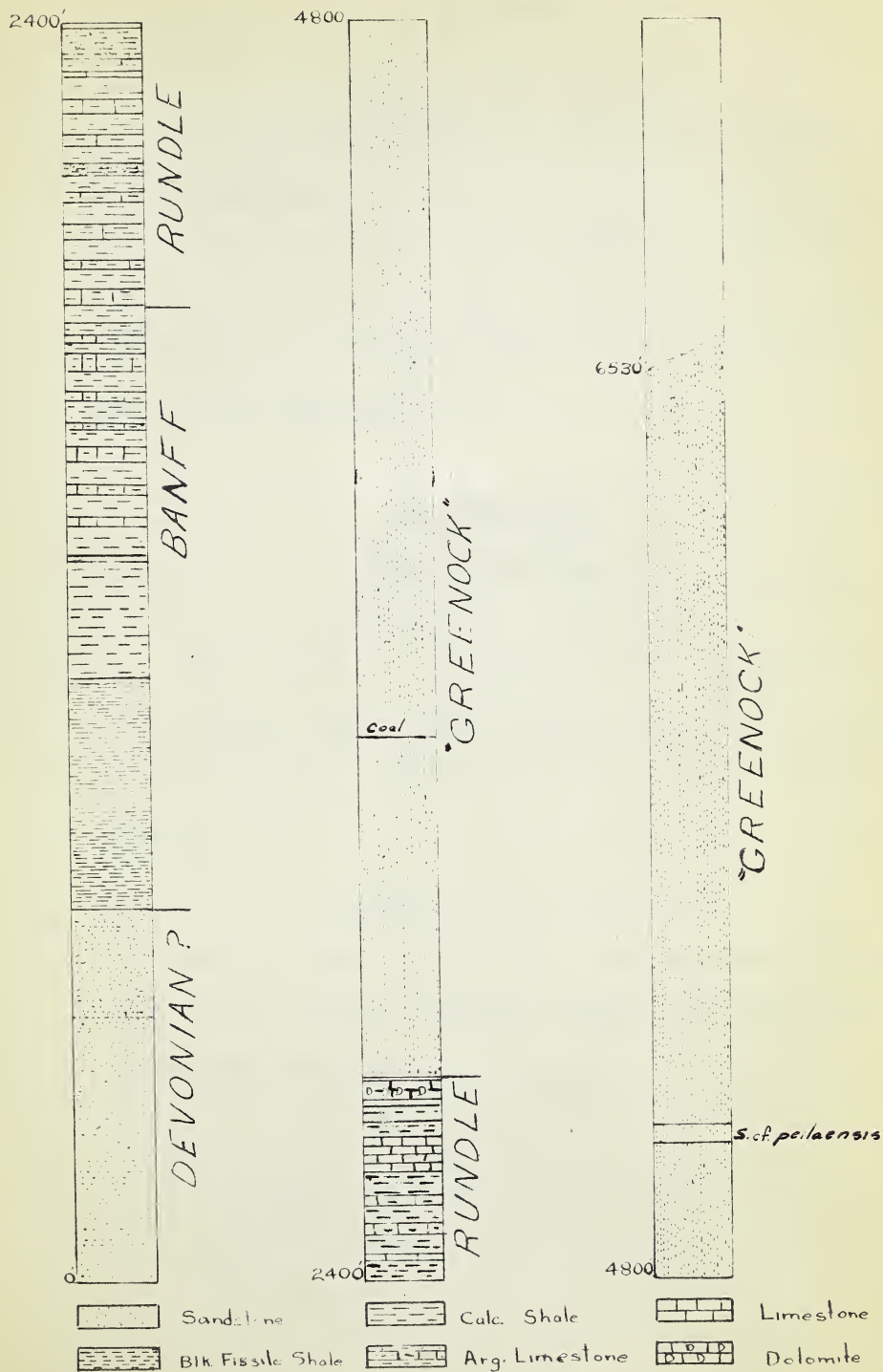
Total Thickness

6530'

CARBONIFEROUS SECTION

JACKFISH RIVER

N.W.T.



Chapter 3

PALEONTOLOGY AND CORRELATION

DEVONIAN

Interval 0 - 714 feet

The lower sandstones of the section contain crinoid stems, Chonetes sp. indet., and several black, carbonaceous plant fragments. From these fossils no definite conclusion can be drawn as to the age of the rocks. The presence of plant remains, however, would probably indicate an age not older than Devonian.

MISSISSIPPIAN

Banff Formation

Interval 714 - 1160 feet

Above the basal sandstone of the section lie soft, black fissile shales which grade upwards into calcareous dark grey shales. No fossils were found in the black shales.

Interval 1160 - 1318 feet

Fossils were not found in the calcareous shales until the 1318 foot interval, where the following assemblage occurs:

Interval 1318 - 1518 feet

<u>Fossil</u>	<u>Kinderhook</u>	<u>Osage</u>
<u>Brachythyris</u> cf. <u>chouteauensis</u> Weller	x	
<u>Chonetes</u> <u>geniculatus</u> White	x	
<u>Chonetes</u> <u>illinoisensis</u> Worthen	x	
<u>Cleiothyridina</u> <u>obmaxima</u> (McChesney)	x	x
<u>Camarotoechia</u> <u>allani</u> Warren		
<u>Dictyoclostus</u> cf. <u>arcuatus</u> (Hall)	x	
<u>Paleoneilo</u> sp. indet.		
<u>Platyrachella</u> <u>rutherfordi</u> (Warren)		
<u>Punctospirifer</u> <u>solidirostris</u> (White)	x	
<u>Rhipidomella</u> <u>missouriensis</u> (Swallow)	x	
<u>Spirifer</u> <u>centronatus</u> Winchell		
<u>Spirifer</u> cf. <u>grimesi</u> Hall		x
<u>Spirifer</u> cf. <u>marionensis</u> Shumard	x	
<u>Spirifer</u> <u>rowleyi</u> Weller		x
<u>Spirifer</u> <u>striatiformis</u> Meek	x	
<u>Torynifer</u> <u>cooperensis</u> (Swallow)	x	

The majority of these forms have been reported from the Kinderhook of the Mississippi Valley (Weller, 1914), Madison Ls., of Montana (Girty, 1899) or the Banff formation, Alberta, (Warren, 1927).

Spirifer rowleyi Weller and Spirifer cf. grimesi Hall are found in the Fern Glen and Burlington of the Osage of the Mississippi Valley and indicate a higher horizon than Kinderhook, although they occur with typical Kinderhook forms in this interval.

Interval 1559 - 1685 feet

The following fossils were collected from this interval:

Brachythyris cf. chouteauensis Weller
Caninia sp.
Cleiothyridina lata Shimer

cf. Diphyphyllum sp.indet.
Dictyoclostus cf. arcuatus (Hall)
Fenestrellina sp.
Grammysia sp.
Platyrachella rutherfordi (Warren)
Punctospirifer solidrostris (White)
Pseudosyrinx sp.
Rhipidomella missouriensis (Swallow)
Schizophoria sp.
Spirifer cascadensis Warren
Spirifer centronatus Winchell
Spirifer grimesi Hall
Spirifer cf. marionensis Shumard
Spirifer rowleyi Weller
Syringopora cf. surcularia Girty

The fauna of this interval is essentially the same as the last, except for the presence of S. cascadensis Warren and corals. S. cascadensis Warren occurs in the Banff shale at Banff and Jasper, Alberta.

Brown (1952) has described the S. cascadensis faunule as including the following forms:

Chonetes cf. logani Norwood and Pratten
Cyrtina acutirostris Shumard
Productella cf. pyxidata Hall
Leptaena analoga Phillips
Rhipidomella missouriensis Swallow
Spirifer cf. cascadensis Warren
S. greenockensis Brown
S. marionensis Shumard

Some of these fossils are present in this interval and indicate beds correlative with the Lower Banff formation.

Hage (1944, 1945) has reported S. cascadensis from the Sikanni Chief River near the Alaska Highway, North-eastern British Columbia, as well as from a mountain four miles west of Big Island in the Liard River.

Interval 1690 - 1928 feet

Brachythyris chouteauensis (Weller)
Brachythyris sp.
Caninophyllum sp.
Cleiothyridina obmaxima (McChesney)
Dictyoclostus cf. jasperensis Warren
Dictyoclostus sp.
Fenestrellina sp.
Marginirugus sp. indet.
Neozaphrentis sp.
Rhombopora sp.
Rhipidomella cf. diminutiva Rowley
Schellwienella ? or Schuchertella ? sp. indet.
Spirifer albertensis Warren
Spirifer centronatus var. minnewankensis Shimer
Spirifer grimesi Hall

This interval, (1690 - 1928 feet) lacks the diagnostic Kinderhook fossils found lower in the section, while the Burlington forms of Spirifer grimesi Hall and S. rowleyi Weller persist. S. grimesi Hall and Spirifer albertensis Warren indicate beds which correlate with the upper Banff formation at Banff and Jasper.

Brown (1952) has based a faunal zone on S. albertensis Warren. In the Mount Greenock area near Jasper, S. albertensis is found only in the Banff shale. Warren (1927) found S. grimesi in the Banff shale and not from the overlying Rundle formation at Banff.

Fossils from below S. grimesi Hall and S. albertensis Warren in the section indicate beds which correlate with the lower Banff formation.

A problem arises as to the upper boundary of the Banff formation in the section. Argillaceous limestones and shales persist throughout the section to the contact with overlying massive sandstone beds and it is difficult

to draw a boundary between the Banff and Rundle formations on the basis of lithology.

If the last occurrence of S. grimesi Hall and S. albertensis (1863 feet from the base of the section) is used to indicate the top of the Banff formation/^{so}as to give a basis of comparison with the southern sections, then the thickness of the Banff shales is 1150 feet. This includes 440 feet of black shales at the base, which have a similar stratigraphic position to the Exshaw shales further south. No fossils were found in these shales and they are included with the Banff formation because of their lithology which resembles the overlying shales more than the underlying sandstones.

Rundle Formation

Interval 1958 - 2796 feet

This interval includes fossils collected up to the overlying sandstone beds. Fossils were not found as abundantly in this interval as in the lower ones.

Brachythyris chouteauensis Weller
Brachythyris cf. suborbicularis Hall
Cleiothyridina lata Shimer
Composita cf. immatura Girty
Fenestrellina sp.
Pentremites sp.
Platyceras sp.
Platyrachella cf. rutherfordi (Warren)
Platyrachella rutherfordi (Warren)
Polypora sp.
Proetus loganensis Hall
Pustula sp. indet.

Rhombopora sp.
Schellwienella sp.
Spirifer sp. A
Spirifer bifurcatus Hall
Spirifer centronatus Winchell
Spirifer centronatus var. minnewankensis Shimer
Spiriferella sp.
Spiriferella cf. minnewankensis Shimer
Spiriferella minnewankensis Shimer
Torynifer pseudolineata (Hall)
Triplophyllites sp.

The following fossils of this interval: Spirifer centronatus Winchell, Torynifer pseudolineata Hall, Brachythyris chouteauensis Weller and Cleiothyridina lata Shimer, occur in the Banff as well as the Rundle formation. The beds from which these fossils were collected are considered to be lower Rundle because of their stratigraphic position over beds yielding fossils typical of the Banff shales and absence of any diagnostic Kinderhook forms. Brachythyris cf. suborbicularis Hall and Torynifer pseudolineata (Hall) are found in the Keokuk of the Osage group in the Mississippi Valley.

Spirifer bifurcatus Hall of the Salem limestone of the Meramec group of the Mississippi Valley has not been reported from the Mississippian rocks of Canada before.

The thickness of the beds which are assigned to the Rundle formation is 930 feet. This includes beds from the last occurrence of Spirifer grimesi Hall and S. albertensis Warren to the contact with overlying massive sandstone beds.

"Greenock" Formation

The sandstones of the section from 2796 to 5060 feet contain few fossils.

A coal seam occurs in the interval from 3444 to 3448 feet. Plant fossils Stigmaria sp. and Lepidodendron sp. were collected at 3900 and 3957 feet from the base of the section. Ripple marks and cross bedding are common in the enclosing sandstone.

Interval 5060 - 5092 feet

The fossils from these beds are:

Composita subquadrata (Hall)
Composita sp. A
Composita sp. B
Spirifer cf. pellaensis Weller

Spirifer pellaensis Weller occurs in the Pella Beds of the St. Genevieve Limestone of the Meramec Group, Mississippi Valley, and has also been reported from the upper Rundle at Crowsnest Pass by Warren (1933) and at Moose Mountain by Beach (1943) as well as from the Greenock formation at Jasper by Brown (1952)

Composita subquadrata (Hall) occurs 32 feet above the Spirifer pellaensis beds. This form occurs in the Chester of the Mississippi Valley.

Only plant fossils Lepidodendron sp. were found in this interval from 5092 to 5760 feet.

At 6210 feet in the section, Eumetria cf. vera (Hall) was collected. This form occurs in the Chester of the Mississippi Valley and was reported from the Rundle formation at Banff by Warren (1927)

Occurring with it are Compositasp. C and Dictyoclostus sp indet.

Orbiculoidea sp. and Dictyoclostus cf. inflatus (McChesney) occur at 6233 - 6250 feet in the section. D. inflatus (McChesney) of the Chester of Illinois and Missouri has been found by Williams (1944) from Tetsa River, Northern British Columbia, near the Alaska Highway and was also found by Warren (1927) in the upper Rundle at Banff.

A few crinoid stems occur at 6512 feet in the section. The age of the top 280 feet (6250' - 6530') is in doubt as no diagnostic fossils are present.

The total thickness of the sandstones from the contact with the underlying limestones to the beds containing Dictyoclostus cf. inflatus (McChesney), is 3450 feet.

The sandstones of the Jackfish section are the same age as the upper Rundle and the Greenock formations since they contain similar fossils.

TENTATIVE CORRELATION
MISSISSIPPIAN OF WESTERN CANADA
(After Brown 1952)

S. NAHANNI AREA		MOUNT GREENOCK Brown	BANFF Warren	MOOSE MOUNTAIN Beuch	CROWSNEST PASS Warren		MISSISSIPPI VALLEY
Greenock	<i>S. cf. pellaensis faunule</i>	Greenock				<i>S. cf. pellaensis faunule</i>	Chester
Rundle		Rundle	Rundle	Rundle	Rundle		Meramec
	<i>Burlington faunule</i>					<i>Burlington faunule</i>	Osage
	<i>S. albertensis faunule</i>					<i>S. albertensis faunule</i>	
	<i>S. cascadiensis faunule</i>					<i>S. cascadiensis faunule</i>	
Banff		Banff	Banff	Banff	Banff		Kinderhook

Conclusions

Rocks of Kinderhook, Osage, Meramec and Chester ages are indicated from fossils collected. Fossils of Kinderhook and Osage ages are common but only a few Meramec and Chester forms were found.

No semblance of/^{an} unconformity was observed in the section. The close association of Spirifer grimesi Hall and S. rowleyi Weller, as well as other Burlington forms with Kinderhook fossils, indicates no break in sedimentation in Osage time as Laudon (1948) would believe.

The Rundle formation has lost its identity in the South Nahanni Area and is represented by argillaceous limestones and calcareous shales or sandstones.

North of Jasper, the upper boundary of the Banff formation rises in section or becomes younger in age. Laudon (1949), named argillaceous limestones and shales the Dessa Dawn formation at Wapiti Lake, British Columbia. These beds are probably equivalent to the lower Rundle. Harker (1952), who has been studying the Carboniferous of the Rocky Mountains since 1948, believes the Banff-Rundle boundary to be diachronic.

At the Jackfish section near South Nahanni River, 930 feet of beds of argillaceous limestones and shales have been referred to the Rundle as they occupy a similar stratigraphic position. The Banff-Rundle boundary has been based on fossil evidence.

Spirifer cf. pellaensis Weller, Composita subquadrata (Hall), Eumetria cf. vera (Hall) and Dictyoclostus cf. inflatus (McChesney) are found in the upper beds of the Greenock formation in the Jackfish River section. These fossils are found in the upper Rundle and the Greenock formation further south, (Warren 1927, 1928; Beach, 1943; Brown, 1952). A great thickness of sandstone, 2,260 feet, occurs below the Spirifer cf. pellaensis zone in which plant fossils Stigmaria sp., Lepidodendron sp. and a thin coal seam were found. These sandstones are equivalent in age to a large part of the Rundle since they occur below the S. cf. pellaensis zone. Deposition must have begun fairly early in Rundle time in order to have laid down such a thick section of sandstone before upper Rundle time.

A similar sequence of 1470 feet of sandstone occurs above the S. cf. pellaensis zone from which other plant fossils were collected. Stigmaria sp. and Lepidodendron sp. as well as cross bedded and ripple marked sandstones, indicate near shore conditions of deposition in upper Mississippian or Rundle time in the South Nahanni Area.

Chapter 4

Fossil Descriptions

CLASSIFICATION . TABLE

Phylum COELENTERATA

Class, ANTHOZOA

Subclass, TETRACORALLA

Family, HAPSIPHYLLIDAE Graham, 1928

Genus, TRIPLOPHYLLITES Easton, 1944
Triplophyllites sp.

Genus, NEOZAPHRENTIS Grove, 1935
Neozaphrentis sp.

Family, CANINIIDAE

Genus, CANINIA Michelin in Gervais, 1840
Caninia sp.

Genus, CANINOPHYLLUM Lewis, 1929
Caninophyllum sp.

Family, LITHOSTROTIONTIDAE Grabau, 1927, Chi, 1931

Genus, DIPHYPHYLLUM Lonsdale,
cf. Diphyphyllum sp.

Family, SYRINGOPORIDAE Milne, Edwards and Haime

Genus, SYRINGOPORA Goldfuss, 1826
Syringopora cf. surcularia Girty, 1899

Phylum BRYOZOA

Class, GYMNOLEMMATA

Order, CRYPTOSTOMATA

Genus, RHOMBOPORA Meek, 1872
Rhombopora sp.

Genus, SULCORETEPORA d'Orbigny, 1849
Sulcoretepora sp.

Genus, FENESTRELLINA d'Orbigny, 1849
Fenestrellina several species

Genus, POLYPORA McCoy, 1845
Polypora sp.

Phylum BRACHIOPODA

Class, INARTICULATA

Order, NEOTREMATA

Superfamily, DISCINACEA

Genus, ORBICULOIDEA d'Orbigny
Orbiculoidea sp. indet.

Class, ARTICULATA

Order, PROTREMATA

Superfamily, ORTHACEA

Family, DALMANELLIDAE

Genus, RHIPIDOMELLA Oehlert, 1890
Rhipidomella missouriensis (Swallow)
Rhipidomella cf. diminutiva Rowley

Family, SCHIZOPHORIDAE Schuchert, 1929

Genus, SCHIZOPHORIA King, 1850
Schizophoria sp. indet.

Superfamily, STROPHOMENACEA Schuchert, 1896

Family, STROPHOMENIDAE King, 1846

Subfamily, ORTHOTETINAE Waagen, 1884

Genus, SCHELLWIENELLA Thomas, 1910
Schellwienella sp. indet.

Family, CHONETIDAE Hall and Clarke, 1895

Genus, CHONETES Fischer, 1837

Chonetes sp. indet.

Chonetes geniculatus White

Chonetes illinoisensis Worthen

Family, PRODUCTIDAE Gray, 1840

Subfamily, PRODUCTINAE Waagen, 1930

Genus, DICTYOCLOSTUS Muir-Wood 1930

Dictyoclostus cf. jasperensis (Warren)

Dictyoclostus cf. arcuatus (Hall)

Dictyoclostus cf. inflatus (McChesney)

Genus, MARGINIRUGUS Sutton, 1938

Marginirugus sp. indet.

Genus, ECHINOCHONCHUS Weller, 1914

Echinochonchus sp.

Genus, PUSTULA Thomas, 1914

Pustula sp. indet.

Order, TELOTREMATA Beecher, 1891

Superfamily, RHYNCHONELLACEA Schuchert, 1896

Family, CAMAROTOECHIIDAE Schuchert, 1929

Subfamily, CAMAROTOECHIINAE Schuchert, 1929

Genus, CAMAROTOECHIA Hall and Clarke, 1893

Camarotoechia allani Warren

Superfamily, SPIRIFERACEA Waagen, 1883

Family, SPIRIFERIDAE King, 1846

Subfamily, SPIRIFERINAE Schuchert, 1913

Genus, PLATYRACHELLA Fenton and Fenton, 1924

Platyrachella rutherfordi (Warren)

Genus, SPIRIFER Sowerby, 1818

Spirifer centronatus Winchell

Spirifer centronatus var. minnewankensis Shimer

Spirifer albertensis Warren

Spirifer cascadiensis Warren

Spirifer striatiformis Meek
Spirifer rowleyi Weller
Spirifer cf. grimesi Hall
Spirifer grimesi Hall
Spirifer bifurcatus Hall
Spirifer cf. pellaensis Weller
Spirifer sp. A

*

Genus, BRACHYTHYRIS McCoy, 1844
Brachythyris cf. chouteauensis Weller
Brachythyris chouteauensis Weller
Brachythyris sp.
Brachythyris cf. suborbicularis Hall

Subfamily, SYRINGOTHYRINAE Schuchert, 1929

Genus, PSEUDOSYRINX Weller, 1914
Pseudosyrinx sp. A

Subfamily, RETICULARIINAE Waagen, 1883

Genus, TORYNIFER Hall and Clarke, 1895
Tornifer cooperensis (Swallow)
Tornifer pseudolineata (Hall)

Family, SPIRIFERINIDAE Davidson 1884

Subfamily, SPIRIFERININAE Schuchert and Levene,
1929

Genus, PUNCTOSPIRIFER North, 1920
Punctospirifer solidirostris (White)

Superfamily, ROSTROSPIRACEA Schuchert and Levene, 1929

Family, ATHYRIDAE Phillips, 1841

Subfamily, ATHYRINAE Waagen, 1863

Genus, CLEIOTHYRIDINA Buckman, 1906
Cleiothyridina lata Shimer
Cleiothyridina obmaxima (McChesney)

Genus, COMPOSITA Brown, 1849
Composita cf. immatura (Girty)
Composita subquadrata (Hall)
Composita sp. A
Composita sp. B
Composita sp. C

* Genus SPIRIFERELLA Tschernyshev
Spiriferella sp.
Spiriferella minnewankensis Shimer

Family, THECASPIRIDAE

Genus, EUMETRIA Hall
Eumetria cf. vera Hall

Phylum MOLLUSCA

Class, GASTROPODA

Subclass, ANISOPLEURA

Super Order, PROSOBRANCHIA

Order, ARCHAEOGASTROPODA

Genus, PLATYCERAS Conrad, 1840
Platyceras sp. indet.

Class, PELECYPODA

Subclass, PRIONODESMACEA

Order, PALEOCONCHA

Genus, GRAMMYSIA DeVerneuil, 1847
Grammysia sp. indet.

Order, TAXODONTA

Suborder, NUCULACEA

Genus, PALAEONEILO Hall, 1867
Paleoneilo sp. indet.

Phylum ARTHROPODA

Class, TRILOBITA

Order, PROPARIA

Genus, PROETUS, Steininger, 1831
Proetus loganensis Hall and Whitfield

Phylum ECHINODERMATA

Subphylum PELMATOZOA

Class, BLASTOIDEA

Genus, PENTREMITES Say, 1820

Pentremites sp.

PLANT KINGDOM

Phylum PTERIDOPHYTA

Class, LYCOPODIALES

Suborder, LIGULATAE

Family, LEPIDODENDRACEAE

Genus, LEPIDODENDRON Sternberg, 1820

Lepidodendron sp. A

Lepidodendron sp. B

Genus, STIGMARIA Brongniart, 1822

Stigmaria sp.

FOSSIL DESCRIPTIONS

Phylum BRACHIOPODA

Genus, ORBICULOIDEA d'Orbigny

Orbiculoidea sp. indet.

Plate 1 figs. 1-3

Description #39063

Shell circular, 15 to 20 mm. in diameter; original shape of pedicle valve not well preserved, but appears to be flat with a small ovate area surrounding the pedicle opening depressed or raised internally.

Pedicle opening slightly off centre, 4 to 5 mm., closer to the posterior margin; foramen, 4 mm. in length; shell thickens unequally from centre outwards forming a wide band of thickened shell anteriorly and a narrower band posteriorly; surface ornamented with concentric rings, about three occurring in one millimetre; internally the thickened portion of the shell shows radial ornament except for the posterior sector which is smooth; brachial valve not recognized.

Remarks

Specimens of the type described are abundant 300 feet from the top of the section.

Occurrence

6233' - 6250' from the base of the section, Jackfish R., Greenock formation.

Genus, RHIPIDOMELLA Oehlert, 1890

Rhipidomella missouriensis (Swallow)

Plate 1 figs. 4-9

1860 Orthis missouriensis Swallow

Trans. St. Louis Acad. of Sci., Vol.1, p. 639

1949 Rhipidomella missouriensis Weller, Mon. 1, Illinois
State Surv., p. 148, Pl. 20, figs. 1-8

1953 Rhipidomella missouriensis Hyde, Ohio Div. of Geol.
Surv., Bull. 51, p. 220, Pl. 6, figs. 17-30

Dimensions #39007, #39002

Brachial Valves

<u>Length</u> <u>mm.</u>	<u>Width</u> <u>mm.</u>	<u>Length/Width</u>
21	24	.88
22	24	.92
20	21	.95
20	24	.83
17	19	.90
22	26	.85

Pedicle Valves

<u>Length</u> <u>mm.</u>	<u>Width</u> <u>mm.</u>	<u>Length/Width</u>
23	25	.92
23	26	.89

Remarks

Brachial valves were found more frequently than pedicle valves. The pedicle valves are somewhat larger than those described by Weller or Hyde, but the nature of the surface ornament of four costae per millimetre, the general shell outline and muscle scars indicate these specimens to be Rhipidomella missouriensis.

Occurrence

Banff formation, 1518' - 1564' from the base of the section.

Rhipidomella cf. diminutiva Rowley

1900 Rhipidomella diminutiva Rowley, Amer. Geol. Vol. 25,
p. 261, Pl. 5, figs. 41-43

1914 Rhipidomella diminutiva Weller, Mon. 1, Illinois
State Geol. Surv., Vol. 1, p. 153, Pl. 20,
figs. 9-18, 30-35

Remarks #39002, #39032

Only the pedicle valves are well preserved. Dimensions are: length 17 mm. and 16 mm., width 12 mm. and 14 mm. These valves resemble R. diminutiva Rowley, but the evidence available from the two valves is insufficient to refer them definitely to this species.

Occurrence

1564' and 1928' from the base of the Section, Banff and Rundle formations.

Genus, SCHIZOPHORIA King, 1850

Schizophoria, sp. indet.

Remarks #39002

A brachial valve and a badly exfoliated specimen showing muscle scars which are characteristic of Schizophoria are the only representatives of this genus in the collection. The dimensions are: exfoliated specimen length 22 mm., width 24 mm., thickness 9 mm.; brachial valve length 24 mm., width 27 mm. The surfaces of these shells have three costae per millimetre. The shells are radially punctate with the tubules opening on the summits of the rounded costae.

Occurrence

1564' from the base of section, Banff formation.

Genus, SCHELLWIENELLA Thomas, 1910

Schellwienella, sp. indet.

Description #39010

Brachial valve only; length 30 mm., width at hinge line 42 mm., greatest width 50 mm; umbonal region flat, greatest convexity slightly anterior to the mid-length, shell surface curves sharply to the anterior margin from the flat umbonal region and more gently to the lateral margins; crural plates, short, widely divergent and strong, joining posteriorly with the cardinal process which is bilobed and slightly raised above the crural plates; costae approximately 1 mm. apart at the anterior margin, costae low, narrow and rounded with inter-costal spaces broad, about equal in width to two costae, intercostal spaces, pseudopunctate and showing crenulations due to concentric growth lines; interior of the valve shows tiny tubules or spines, directed to the lateral and anterior margins at a low angle to the shell and parallel with the costation.

Occurrence

1895' from base of section, Rundle formation.

Genus, SCHELLWIENELLA? or SCHUCHERTELLA?

Remarks

Numerous shell fragments belonging to either one of these forms occur abundantly throughout the section but are unidentifiable specifically because of their incomplete nature.

Genus, CHONETES Fischer, 1837

Chonetes, sp. indet.

Description #39079

Pedicle valve only, small - length 2 mm., width 3 mm., hinge line equal to greatest width of shell; auriculations angular and terminated by spines, two spines on either side of beak at right angles to the hinge line; surface ornamented with forty comparatively coarse costae for the size of the specimen.

Remarks

This specimen, along with crinoid columnals and plant remains are the only fossils present from the lowermost part of the section.

Occurrence

200' from the base of the section in sandstone,
probably Devonianⁱⁿ/age.

Chonetes geniculatus (White) 1862

Plate 1 fig. 10

1862 Chonetes geniculata White, Proc. Boston, Nat. Hist.,
Vol. 9, p. 29

1914 Chonetes geniculatus Weller, Mon. 1, Illinois State
Geol. Surv., p. 92, Pl. 8, figs. 35-42

Remarks #39004

Dimensions of pedicle valves are: length 6 mm., width 8 mm. Three spines are present on either side of beak. The auriculations are terminated with a large spine. These

specimens are larger than those described by Weller and compare favourably in size and shape with C. logani Norwood and Pratten, but have six crenulated costae per millimetre instead of three as in C. logani. Because of this finer surface ornament, these specimens are considered to be C. geniculatus rather than C. logani.

Occurrence

1383' from the base of the section, Jackfish R., Banff formation.

Chonetes illinoisensis Worthen

Plate 1 figs. 11-12

1853 Chonetes logani Hall, Geol., Iowa, Vol. 1, Pt. 2,
p. 598, Pl. 12, figs. 1a-e - 2

1914 Chonetes illinoisensis Weller, Mon. 1, Illinois
State Geol. Surv., p. 81, Pl. 8, figs. 63-70

Remarks #39003

Two specimens compare favourably in size with those described by Weller. The rest of the specimens are smaller: 9 mm. long and 13 mm. wide. Four spines are developed on either side of the beak along the cardinal margin, which aid in differentiation of these forms from C. burlingtonensis Weller, which are of the same size and have the same surface ornamentation of from five to six costae per millimetre. A shallow sinus is present on two of the well preserved specimens which is not present in C. burlingtonensis.

Occurrence

1460' from the base of the section, Jackfish R., Banff formation.

Genus, DICTYOCLOSTUS Muir-Wood, 1930

Dictyoclostus cf. jasperensis Warren

Plate 1 figs. 13-15

1932 Dictyoclostus jasperensis Warren, Trans. Roy.
Soc. of Canada, Vol. 26, p. 243, Pl. 1,
figs. 1-6

Remarks #39010

One slightly squashed pedicle valve has similar ornamentation and curvature of the shell as D. jasperensis. It differs from D. jasperensis in that the umbonal region is narrower and not as flat.

Occurrence

1895' from the base of the section, Rundle formation.

Dictyoclostus cf. arcuatus Hall

1858 Productus arcuatus Hall, Geol. Iowa, Vol. 1,
Pt. 2, p. 518, Pl. 7, figs. 4a-b

1914 Productus arcuatus Weller, Mon. 1, Illinois State
Geol. Surv., Vol. 1, p. 107, Pl. 13,
figs. 1-12

Remarks #39007, #39002

Two distorted pedicle valves are referred to this species. The ornamentation of the shell is finer, the costae are about 1 mm. apart but are narrower than in D. arcuatus as described by Weller.

Occurrence

1518' to 1564' Jackfish R. section, Banff formation.

Genus, PUSTULA Thomas, 1914

Pustula, sp. indet.

1938 Pustula Sutton, Jour. of Paleo. Vol. 1, p. 554,
Pl. 66, figs. 8-10

Description #39016

One poorly preserved, large pedicle valve, dimensions: length 45 mm., width 52 mm.; shell thin with indistinct concentric banding; bands show large, irregularly spaced spine bases; beak sharp, and strongly incurved over the hinge line; umbonal region, flat and drops off abruptly to the lateral margins and gently to the anterior margin.

Remarks

The Pustulas described in the literature are generally smaller, and a form to which this specimen could be compared was not found.

Occurrence

1958' from the base of section, Rundle formation.

Genus, MARGINIRUGUS Sutton, 1938

Marginirugus, sp. indet.

1938 Marginirugus Sutton, Jour. Pal., Vol. 12, p. 559,
Pl. 63, figs. 10-13

Remarks #39031

Two very large incomplete productid shells have the following dimensions: lengths approximately 50 mm. and 45 mm., widths 65 mm. and 70 mm. These shells show very fine radiating costae for the size of the shell and a reticulate pattern of ornamentation. The incomplete nature of the specimens make specific identification impossible.

Occurrence

1825' to 1853', Jackfish R. section, Banff formation.

Genus, ECHINOCHONCHUS Weller, 1914

Echinochonchus sp.

Plate 1 figs. 16-18

Description #39055

Pedicle valve, medium size, length 42 mm., width 44 mm., width at hinge line 34 mm.; beak small, incurved, over the hinge line and low cardinal area, umbonal region flat posteriorly but develops a shallow sinus that broadens but remains distinct anteriorly; shell extended anteriorly to form a trail; ornamentation consists of concentric bands and spines, the margin of each band sloping steeply to the anterior; bands bear two sizes of spines, the smaller spines occur in single concentric rows on the posterior portion of

the bands, normal or at a high angle to the shell; larger spines 1 mm. apart directed anteriorly at a low angle to the shell; large spine bases originate at the posterior margin of the bands and extend to the anterior margin, are often produced or extended on to the next band.

Brachial valve concave, extended anteriorly with the pedicle valve in a trail, surface ornamented similarly to the pedicle valve except that the concentric bands are not as distinct and the large spine bases are shorter.

Remarks

A form to which this productid could be referred could not be found in the literature available and it may be a new species.

Occurrence

From rubble about 1800' from base of section.

Dictyoclostus cf. inflatus (McChesney)

1860 Productus inflatus McChesney, Desc. New Foss. p. 40

1914 Productus inflatus Weller, Mon. 1, Illinois State Geol. Surv. Vol. 1, p. 111, Pl. 10, figs. 1-6

Remarks #39063

Several medium-sized specimens, length 27 mm., width at hinge line 34 mm., are geniculate and have a sinus and surface ornament like D. inflatus as described by Weller

Occurrence

6233' - 6250' from the base of the section,
Greenock formation.

Dictyoclostus, spp. indet.

Remarks #39066, #39064

Several fragments of other productid shells occurring at 6210' and 6310' from the base of the section are not complete enough to warrant description.

Genus, CAMAROTOECHIA Hall and Clark, 1893

Camarotoechia allani Warren

1932 Camarotoechia allani Warren, Trans. Roy. Soc.,
Canada, sec. 4, 3rd. ser., Vol. 26, p. 244,
Pl. 2, figs. 12-15

Remarks - #39007

A single flattened specimen has six costae on fold and sinus, while a smaller specimen shows five on fold and sinus. Nine to ten costae are present on the lateral shell surfaces.

Occurrence

1518' from base of section Jackfish R., Banff formation.

Genus, PLATYRACHELLA Fenton and Fenton, 1924

Platyrachella rutherfordi (Warren)

Plate 5 figs. 2-6

1932 Spirifer rutherfordi Warren, Trans. Roy. Soc. Canada,
3rd. sers. Vol.26, sec.4, p.247, Pl.2, figs.1-4

1952 Platyrachella rutherfordi Brown, Geol. Surv. Canada,
Mem.264, p. 94, Pl. 5, figs. 6a-d

Remarks

Three pedicle valves show surface ornamentation as in Platyrachella rutherfordi Warren but vary greatly in the height and convexity of the cardinal areas.

Dimensions of Delthyrium

<u>Specimen</u>	<u>Height</u>	<u>Width</u>
#39008	10 mm.	8-9 mm.
39002a	9 mm.	10 mm.
39002b	9 mm.	- -

Occurrence

1518' - 1564' from base of section, Jackfish R., Banff formation. Two pedicle valves with a normal type of cardinal area occur higher in the section at 2588', Rundle formation.

Genus, SPIRIFER Sowerby, 1818

Spirifer centronatus Winchell

Plate 2 figs. 1-6

1865 Spirifera centronata Winchell, Acad. Nat. Sci.
Phila. Proc. p. 118

1899 Spirifer centronatus Girty, Mon. 32, U.S. Geol.
Surv., Pt. 2, Ch. 12, sec. 2, p. 547,
Pl. 20, figs. 3a-d

Remarks #39048, #39066, #39007, #39038, #39010

This species of Spirifer is one of the most abundant forms in the section. It occurs abundantly at two horizons, 1518' and 1595'.

Occurrence

1518' - 1963' Jackfish R. section, Banff and Rundle formations.

Spirifer rowleyi Weller

Plate 2 figs. 10-12

Plate 3 fig. 1

1914 Spirifer rowleyi Weller, Mon. 1, Illinois State
Geol. Surv., Vol. 1, p. 360, Pl. 53,
figs. 3-6; Pl. 54, fig. 14

Remarks - #39006, #39007

Dimensions of a large pedicle valve, length 55 mm., width, slightly over 80 mm. Several large specimens have been referred to S. rowleyi because of their narrow beak and umbonal region, shallow, narrow sinus and general shell form which agree well with Weller's description. These specimens differ, however, from those described by Weller in that the costae are fewer and broader. Only ten costae occur in the sinus, two arise from each lateral bounding costae and the others by bifurcation of three primary costae which arise in the beak. In Weller's forms, twenty costae or more are present in the sinus, due to further bifurcation of the primary costae.

S. logani Hall, S. grimesi Hall, S. gregeri Weller, S. arkansanus Girty and S. brazerianus Girty are forms which are closely related and represented by S. striatus in Europe.

A great deal of variation in the manner of branching of the costae of these Spirifers has been noted by Girty (Girty, 1911, Mansfield and Girty, 1927). Girty's description of S. arkansanus states that bifurcation may occur freely to give a form with costation similar to S. logani.

S. arkansanus normally has eight costae in the sinus.

S. brazerianus shows finely and coarsely costate shells, depending on the frequency of bifurcation. Girty (1927) has noted the close resemblance of S. brazerianus to S. logani and S. grimesi.

The specimens in the collection have been referred to S. rowleyi on the basis of shell form and outline rather than costation. S. rowleyi is subelliptical while S. brazerianus and S. arkansanus as figured by Girty are subovate. From figures by Weller and Girty (1911) the cardinal margins of S. rowleyi are straight and normal to the plane of symmetry through the shell while the cardinal margins of S. arkansanus are swept forward.

Occurrence

1518' to 1588' Jackfish R. section, Banff formation.

Spirifer cf. grimesi Hall

Plate 3 fig. 2

1858 Spirifer grimesi Hall, Geol. Iowa, Vol. 1, Pt. 2,
p. 604, Pl. 14, figs. 1-5

1914 Spirifer grimesi Weller, Mon. 1, Illinois State
Geol. Surv., Vol. 1, p. 361, Pl. 51, figs. 1-2
Pl. 52, figs. 1-4, Pl. 53, figs. 1-5

Remarks - #39007

One specimen, small in size for S. grimesi, length 65 mm., width 80 mm., shows a broad umbonal region and low, broad sinus.

Occurrence

1518' from base of section, Banff formation.

Spirifer grimesi Hall

Plate 3 figs. 3-6

Plate 4 figs. 1-2

1858 Spirifer grimesi, Hall, Geol., Iowa, Vol. Pt. 2,
p. 604, Pl. 14, figs. 1-5

1914 Spirifer grimesi Weller, Mon. 1, Illinois State
Geol. Surv. Vol. 1, p. 361, Pl. 51, figs. 1-2;
Pl. 52, figs. 1-4; Pl. 53, figs. 1-2

Dimensions

<u>Specimen</u>	<u>Pedicle Valves</u>		<u>Brachial Valves</u>
	<u>Length</u>	<u>Width</u>	<u>Length</u>
#39019	70 mm.	86 mm.	55 mm.
#39020	65 mm.	86 mm.	50 mm.

Remarks

One of the pedicle valves shows minute surface markings of ten radiating striations per millimetre as well as finer concentric markings, two to every millimetre.

Occurrence

1685', 1853', 1873' Jackfish R. section, Banff formation.

Spirifer cascadiensis Warren

1927 Spirifer cascadiensis Warren, Geol. Surv. Canada,
Mem. 1953, p. 58, Pl. 7, figs. 1-2

Remarks - #39020

Only one pedicle valve found with a length of 31 mm., and width of slightly greater than 54 mm. The cardinal extremities are broken off but growth lines indicate angular terminations.

The sinus has nine plications while the lateral slopes show twenty-nine at the anterior lateral margins. Bifurcation of the lateral plications occurs near the beak.

Occurrence

1686' from base of section, Jackfish R., Banff formation.

Spirifer albertensis Warren, 1932

1932 Spirifer albertensis Warren, Trans. Roy. Soc. Canada, Ser. 3, Vol. 26, Sec. 4, p. 247, Pl. 1, figs. 7-14

1952 Spirifer albertensis Brown, Geol. Surv. Canada, Mem. 264, p. 95

Occurrence

1518' to 1863' from the base of section, Jackfish R., Banff formation.

Spirifer striatiformis Meek

Plate 4 fig. 3

1875 Spirifer (Trigonotreta) striatiformis Meek, Pal. Ohio, Vol. 2, p. 289, Pl. A, figs. 8a-e

1914 Spirifer striatiformis Weller, Illinois State Geol. Surv., Mon. 1, p. 364, Pl. 48, figs. 17-21

1953 Spirifer striatiformis Hyde, Ohio, Div. Geol. Surv. Bull. 51, p. 260, Pls. 25, 26, figs. 1-15; 1-25

Dimensions- #39007, #39006

Pedicule Valves	
<u>Length</u>	<u>Width</u>
35 mm.	42 mm.
33 mm.	-
37 mm.	50 mm.

Remarks

Several specimens of this species compare very favourably with those described by Weller and Hyde. These specimens have eight costae in a shallow sinus. About eight longitudinal striations are present on each costae.

Occurrence

1518' to 1588' from base of section, Jackfish R., Banff formation.

Spirifer centronatus var. minnewankensis Shimer

1926 Spirifer centronatus var. minnewankensis Shimer
Geol. Surv. Canada, Bull 42, p. 52, Pl. 1,
figs. 8a-b

Plate 2 figs. 7, 8

Remarks - #39013

Specimens showing straight lateral margins occur fairly abundantly. Brown has named those forms with straight lateral margins S. minnewankensis. Specimens of S. centronatus with straight lateral margins are found in the Banff shale in this section and it is thought best to refer these to S. centronatus var. minnewankensis rather than to try to differentiate them from Brown's new species, S. minnewankensis from the Rundle formation.

Occurrence

1518' to 1958' Jackfish R. section, Banff and Rundle formations.

Spirifer sp. A

Description - #39009

A number of specimens show structural features which easily differentiate them from other *Spirifers* occurring in the section, unfortunately, they are not complete enough to permit a full description.

Dimensions of pedicle valves, length greater than 23 mm., width approximately 44 mm.; cardinal extremities angular; beak and umbo strongly convex; beak small, low and sharply incurved over the low concave cardinal area; cardinal area sharply defined from the general shell surface; hinge plate thick and strong, about 5 mm. in width; delthyrium slightly wider than high, dental lamellae short and stout, umbonal cavity completely filled to form a solid, thickshell behind the hinge plate; the strong hinge plate and the umbonal region well preserved but the thinner shelled anterior portions of the shell broken off in all of the specimens; sinus deep and sharply defined at the beak, remaining deep but broadening anteriorly; two lateral costae arise from the lateral bounding costae in the umbonal region, no medium costae present, anterior portions of the shells absent, not known if more costae arise from the laterals in the sinus; lateral shell surface ornamented with simple costae as developed in S. centronatus Winchell, fine longitudinal striations present on costae and intercostal spaces.

Remarks

The thick, heavy shell of the posterior region and the narrow, deep, sharply defined sinus, with no median plication indicate a distinct species of Spirifer. A form to which this specimen could be referred was not found in the literature.

Occurrence

2630' from base of section, Jackfish R., Rundle formation.

Spirifer cf. pellaensis Weller

Plate 4 figs. 4-13

Plate 5 fig. 1

1914 Spirifer pellaensis Weller, Mon. 1, Illinois State Geol. Surv., p. 340, Pl. 45, figs. 1-31

Remarks - #39000

Shells vary in size from 13 mm. to 24 mm. in length and from 25 mm. to 34 mm. in width. The large forms show ten to twelve simple rounded plications on the lateral slopes, while the smaller forms show nine. These forms do not have a widely extended hinge line, but are like figs. 22-23 Weller.

Occurrence

5060' from the base of Section, Jackfish R., Greenock formation.

Spirifer bifurcatus Hall

Plate 2 fig. 9

1856 Spirifer bifurcata Hall, Trans. Albany Inst.,
Vol. 4, p. 8

1914 Spirifer bifurcatus Weller, Mon. 1, Ill. State
Geol. Surv., Vol. 1, p. 346, pl. 47, figs. 6-16

Remarks - #39012

The specimens in the collection are smaller than those described by Weller. Only one is over 23 mm. in length. The rest are about 12 mm. in length and 14 mm. in width. They show from six to seven angular costae on the lateral slopes and usually three in the sinus, although several show an extra two that arise from the lateral bounding costae. These Spirifers have been assigned to S. bifurcatus rather than S. leidyi, a very similar form, on the basis of the fewer costae on the lateral slopes. Some of these specimens show extra costae in the fold and sinus and therefore show a close relationship to S. leidyi.

Occurrence

2588' from base of section, Rundle formation.

Spirifer cf. marionensis Shumard

- 1855 Spirifer marionensis Shumard (part) Missouri Geol. Surv., 1st & 2nd Ann. Rept., p. 203, Pl. c, figs. 8a-b (not fig. c)
- 1914 Spirifer marionensis Weller, Illinois Geol. Surv., Mon. 1, p. 308, Pl. 37, figs. 1-7
- 1943 Spirifer marionensis Williams, U.S. Geol. Surv., Prof. Paper 203, p. 85, Pl. 18, figs. 39-50

Remarks

Several poorly preserved specimens do not show the straight angular hinge line but have costation and shell form like S. marionensis.

Occurrence

1518' to 1565' from base of section, Jackfish R., Banff formation.

Genus, BRACHYTHYRIS McCoy, 1844

Brachythyris cf. chouteauensis Weller

Plate 5 figs. 7-11

- 1909 Spirifer chouteauensis Weller, Bull. Geol. Soc. Amer., Vol. 20, p. 306, Pl. 13, figs. 9-10
- 1914 Brachythyris chouteauensis Weller, Mon. 1, Illinois State Geol. Surv., Vol. 1, p. 372, Pl. 57, figs. 4-11

Remarks - #39002, #39006

The forms in the collection are poorly preserved except for one pedicle valve and one smaller complete specimen. The large pedicle valve (Pl.5, figs. 7-9) has a strongly incurved, narrow beak. The umbonal surface curves abruptly laterally at

a constant slope so that the cardinal extremities are not differentiated. Weller's forms show a slight differentiation of the cardinal extremities from the umbonal region. It is for this reason that these specimens have not been referred definitely to B. chouteauensis

Occurrence

1564' - 1588' from the base of the section, Banff formation.

Brachythyris chouteauensis Weller

1909 Spirifer chouteauensis Weller, Bull., Geol. Soc. Amer., Vol. 20, p. 305, Pl. 13, fig. 11

1914 Brachythyris chouteauensis Weller, Illinois State Geol. Surv., Mon. 1, Vol. 1, p. 373, Pl. 57, figs. 4-11

Remarks - #39010

A pedicle valve, rather large for B. chouteauensis is referred to this species. The cardinal extremities are more clearly differentiated from the rest of the shell surface than those forms found lower in the section.

Occurrence

1895' from the base of the section, Jackfish R., Rundle formation.

Brachythyris sp. indet.

Plate 5 figs. 12-15

Description - #39010

Shells of medium size, longer than wide. Dimensions of two specimens - length 32 mm. and 40 mm., width 27 mm. and 32 mm. Pedicle valves moderately convex, greatest convexity posterior to the middle; beak small, moderately incurved, shell surface curves abruptly from the umbonal region to the rounded cardinal extremities; Sinus sharp and narrow at the beak, becoming shallow and broad anteriorly and slightly nasute; four to six obscure costae on the lateral margins; lateral costae generally well defined posteriorly but become lower, broader and more obscure anteriorly; fold of the brachial valve obscurely costate and appears smooth.

Remarks

These specimens resemble B. subcardiformis Hall (Weller, 1914), but are much smaller and narrower.

Occurrence

1895' to 1978' from base of section, Jackfish R., Rundle formation.

Brachythyris cf. suborbicularis (Hall)

Plate 6 figs. 1-5

1853 Spirifer suborbicularis Hall, Geol. Iowa, Vol. 1,
Pt. 2, p. 644

1914 Brachythyris suborbicularis Weller, Mon. 1,
Illinois State Geol. Surv., Vol. 1, p. 374,
Pl. 61, figs. 1-8; Pl. 62, figs. 1-12

1953 Brachythyris suborbicularis Hyde, Ohio State Geol.
Surv., Bull. 51, p. 252

Remarks - #39009

Two pedicle valves are incomplete. The dimensions of two brachial valves are: length 26 and 30 mm., width 40 and 44 mm. Ten low, broad plications occur on either lateral flank. An internal mold of a pedicle valve shows short dental lamellae.

These specimens are smaller than those described by Weller. Weller states that the width is slightly greater than the length, yet some of his figures indicate a difference of 20 mm. between the length and width.

Occurrence

2630' from the base of the section, Jackfish R., Rundle formation.

Genus, SPIRIFERELLA Tschernyshev

Spiriferella sp.

Plate 7 figs. 4-6

Description - #39014

Only one pedicle valve found, shell gibbous, medium size, length 35 mm., width 40 mm., length of hinge line 25 mm., cardinal extremities rounded; beak and umbo strongly convex; shell surface slopes abruptly from the umbo to the cardinal area and less abruptly to the lateral and anterior margins, beak incurved over the concave cardinal area; cardinal area not sharply defined, but rounded out to the general shell surface of the umbo and cardinal extremities; delthyrium, 7 mm. in height and 11 mm. in width; sinus, shallow, originating at the beak, broadens and extends into a nasute projection anteriorly; surface of the shell obscurely costate, three costae on either side of the sinus, remainder of the shell smooth; concentric growth lines common on the anterior half of the shell; entire shell surface pustulose; internally dental lamellae extend at least one-third the length of the shell and diverge at the same rate as the margins of the sinus.

Remarks

This specimen resembles Martinia McCoy and Spiriferella Tschernyshev. Girty (1911) has noted variations in the presence or absence of dental lamellae and costae in specimens resembling Martinia glabra McCoy. Davidson (1851) did not regard Martinia McCoy as a distinct genus as the shell

is not

always smooth and the length of the hinge line is variable. Apparently Martinia may be costate or incostate, or may or may not develop dental lamellae. Spiriferella is a form with dental lamellae well developed extending half the length of the shell, rounded cardinal extremities, and a costate surface with fine pustulose markings.

Spiriferella neglecta Hall (Weller, 1914), is a gibbous form. The specimen from the Jackfish section is gibbous, has strong dental lamellae and a pustulose surface, but lacks distinct costation. There is doubt as to what genus this form should be assigned, but Spiriferella is favoured because of the strong dental lamellae and the pustulose surface.

Occurrence

1963' from the base of the section, Jackfish R.,
Rundle formation.

Spiriferella minnewankensis Shimer

Plate 7 figs. 1-3

1926 Spiriferella minnewankensis Shimer, Geol. Surv.,
Canada, Bull. 42, p. 64, Pl. 3, figs. 1a-d, 2a-c

Remarks - #39012, #39014

Several large specimens, length 32 mm. and 35 mm., width 40 mm. and 44 mm. are like those described by Shimer, but differ in that the sinus of the pedicle and the fold of the brachial valves are obscurely costate. Several shell fragments examined show a smooth fold and sinus. Other than

this, these forms conform very closely to Shimer's description of S. minnewankensis.

Occurrence

2588' from base of section, Rundle formation.

Spiriferella cf. minnewankensis Shimer

Plate 7 figs. 7-9

Remarks - #39014

Two incomplete specimens do not permit measurement. One is over 40 mm. in length. The ornamentation and general shell form are the same as those described above.

Occurrence

1963' from the base of the section, Rundle formation.

Genus, PSEUDOSYRINX Weller, 1914

Pseudosyrinx sp. A

Plate 6 figs. 6-11

1914 Pseudosyrinx n. gen. Weller, Mon. 1, Illinois State
Geol. Surv., Vol. 1, p. 404

Description - #39002, #39007a, #39007b

Three pedicle valves, no brachial valves found.

Dimensions

<u>Specimen</u>	<u>Pedicle Valves</u>	
	<u>length</u>	<u>width</u>
#39007a	40 mm.	80 mm.
39007b	40 mm.	-
39002	35 mm.	90 mm.

Greatest width at the hinge line

<u>Delthyriums</u>	<u>Length</u>	<u>Width</u>
#39007a	19 mm.	12 mm.
39007b	20 mm.	16 mm.
39002	16 mm.	19 mm.

The cardinal areas, flat in two^{of}/the specimens, and slightly concave in the other; beaks project slightly over the cardinal area in the specimens with the flat cardinal areas but are not incurved, surface from the umbonal region anteriorly flat or slightly convex and flat or slightly concave to the lateral margins, cardinal margins angular; sinus well defined, shallow at the beak, but deep and rounded in the bottom anteriorly, lateral surface of shell ornamented with twelve low, broad costae; sinus devoid of ornament except for strong concentric growth

lines and tiny pustulose markings that are present on the entire shell surface. Delthyrial plate concave at the cardinal margin, extended one-half to one-third the length of the delthyrium, no syrinx developed, dental lamellae strong and extended almost half the length of the shell, diverging at the same rate as the lateral margins of the sinus.

Occurrence

1518' to 1564' from the base of the section, Jackfish R., Banff formation.

Genus, TORYNIFER Hall and Clark, 1895

Torynifer cooperensis (Swallow)

Plate 8 figs. 1-4

1860 Spirifer cooperensis Swallow, Trans. St. Louis
Acad. Sci., Vol. 1, p. 643

1914 Reticularia cooperensis Weller, Mon. 1, Illinois
State Geol. Surv., p. 428, Pl. 75, figs. 21-33

Remarks - #39007, #39002

The specimens of the collection are about 20 mm. in length and from 22 to 25 mm. in width. The pedicle valves show a thickness of 10 mm.

Occurrence

1518' to 1564' Jackfish R. section, Banff formation.

Torynifer pseudolineata (Hall)

Plate 8 figs. 5-7

1858 Spirifer pseudolineatus Hall, Geol., Iowa, Vol. 1
Pt. 2, p. 645, Pl. 20, fig. 4

1914 Reticularia pseudolineata Weller, Mon 1, Illinois
State Geol. Surv., p. 429, pl. 74, figs. 1-11,
Pl. 75, fig. 20

Remarks - #39014, #39016

Several large pedicle valves, length 32 mm., width 35 mm., show a shallow, well developed sinus. The cardinal area is large, height 7 mm., width 20 mm. The brachial valves have no fold.

Occurrence

1958' to 1963' from base of section, Jackfish R.,
Rundle formation.

Genus, PUNCTOSPIRIFER North, 1920

Punctospirifer solidirostris (White)

1860 Spirifer solidirostris White, Jour. Boston Soc.
Nat. Hist., Vol. 7, p. 232

1914 Spirifer solidirostris Weller, Mon. 1, Illinois
State Geol. Surv., Vol. 1, p. 292,
Pl. 36, figs. 25-34

Remarks - #39007, #39006

Three specimens, poorly preserved, varying from 12 to 16 mm. in width and from 7 to 8 mm. in length, showing punctate shell structure, with 6 to 7 plications on the flanks and a medial plication in the sinus, have been identified as P. solidirostris.

Occurrence

1518' to 1588' from the base of the section,
Banff formation.

Genus, CLEIOTHYRIDINA Buckman, 1906

Cleiothyridina lata Shimer

Plate 7 fig. 11

1926 Cleiothyridina lata Shimer, Geol. Surv., Canada,
Bull. 642, p. 71, Pl. 4, figs. 1-a-b-c, 1926

Remarks - #39014, #39015, #39016

A number of specimens, larger than those described by
Shimer, show fine radiating and concentric ornament.

Occurrence

1863' to 1963' from the base of the section, Rundle
formation.

Cleiothyridina obmaxima (McChesney)

Plate 7 figs. 10, 12-15

1861 Athryvis obmaxima McChesney, desc. New Spec. Foss. p. 80

1914 Cleiothyridina obmaxima Weller, Mon. 1, Illinois
State Geol. Surv., Vol. 1, p. 475, Pl. 79,
figs. 1-11

Remarks - #39015

Two specimens, one large, length 40 mm., width 50 mm.,
another smaller, length 30 mm. and width 37 mm., show fine
radiating and concentric ornament.

Occurrence

1518' to 1863' from base of section, Jackfish R.,
Banff formation.

Genus, COMPOSITA Brown, 1849

Composita cf. immatura (Girty)

1899 Seminula immatura Girty, U.S. Geol. Surv., Mon. 32,
Pt. 2, p. 566, Pl. 71, figs. 5a-b

1952 Composita immatura Brown, Geol. Surv. Canada, Mon. 264,
p. 105, Pl. 5, figs. 4a-b

Remarks - #39037, #39012

One poorly preserved pedicle valve, length 19 mm.
and width 15 mm., has been referred to Composita immatura
on the basis of its elongate shape and a shallow sinus which
is present only at the anterior margin.

Occurrence

2588' from the base of the section, Rundle formation.

Composita sp. A

Plate 8 figs. 10-11

Description - #39000

Two complete specimens are identical in size; shell
subpentagonal in outline; dimensions, length 14 mm., width
12 mm., two-thirds the distance from the beak; thickness
8 mm.; pedicle and brachial valves equally convex; beak with
a circular foramen, extends over the brachial valve; shell
surface curves from the umbo abruptly posterolaterally,
inflected at the cardinal extremities; anterior portion of
shell flat with broad shallow poorly defined lateral margins
curving to the anterior margin; anterior margin rounded,
except for the sinus which is straight.

The brachial valve more rounded than the pedicle valve laterally with no tendency to flattening anteriorly, mesial fold obsolete, except for a slight curvature at the anterior margin.

Remarks

These forms occur abundantly at the same horizon as S. cf. pellaensis Weller. Only one form with its greatest width so far anterior could be found in the literature. C. trinuclea (Hall, figs. 27, 28 and 29, Pl. 81, Weller, 1914) shows an outline similar to those in the collection. The forms described from Jackfish River, however, do not have fold or sinus as well developed as C. trinuclea.

Occurrence

5060' from base of section, Greenock formation.

Composita sp. B

Plate 8 figs. 12-19

Description - #39000

Shell subtrigonal in outline, wider than long. Dimensions of two specimens - length 10 mm. and 11 mm., width 12 mm., in both shells; slightly anterior to the middle; thickness, 5 to 6 mm., through the umbo of the brachial valve. Pedicle valve, greatest convexity posterior to the midlength, shell surface curves abruptly from the umbo to the posterolateral margins, inflected at

the cardinal extremities, flat to gently curving to the anterolateral margins, beak short, with a circular foramen, not incurved over the other valve; sinus shallow, originates near the midlength of the shell.

Brachial valve; convexity similar to pedicle valve, umbo narrow and prominent; shell surface curves abruptly from the umbo to the posterolateral margins, slightly inflected on either side of umbo, rounded and gently curving to the anterolateral margins; fold, low, develops anteriorly corresponding to the shallow sinus of the pedicle valve.

Shell surface smooth except for occasional growth lines.

Remarks

These forms are from the same horizon as S. pellaensis and Composita Sp. A.

Occurrence

5060' from the base of the section, Greenock formation.

Composita Sp. C

Plate 8 figs. 20-27

Description - #39066

Shell subovate, of medium size; dimensions of three pedicle valves, length 25, 22, and 23 mm., width equal to length, thicknesses 12 mm.; pedicle valves, greatest convexity at the beak; beak small and incurved; foramen small at the contact of the beak with the umbo of the brachial valve; shell surface curves abruptly from the umbo posterolaterally, slightly inflected at the cardinal

extremities and more gently curved anterolaterally, slight sinus developed at the anterior margin, surface concentrically ornamented, three growth lines per millimetre.

Internally, diductor muscle scars ovate, and flabellate, extended about two-thirds the length of the shell, poorly defined anteriorly, deep posteriorly; adductor scars deep, two ridge-like projections separated by a deep furrow arise posteriorly to the adductors; beak of the brachial valve extends into the umbonal cavity; teeth strong, supported by widely divergent dental lamellae; pedicle restricted to a small opening between the floor of the valve and the extended hinge plate of the brachial valve.

Brachial valves more convex than the pedicle valve, beak protruding into the delthyrium of the opposite valve; surface curving abruptly from the umbonal region to the cardinal and posterolateral extremities, curvature gentle to the anterior margin, stronger to the anterolateral margin, hinge plate solid and extended into the umbonal cavity of the pedicle valve; surface ornamented as on the pedicle valve; line of commissure lies in one plane except for a small portion at the anterior margin where a slight fold and sinus are developed.

Remarks

This form is closely related to C. subquadrata Hall in size, but is not as elongate. The beak of the brachial valve protrudes into the delthyrium of the pedicle valve as in C. subquadrata.

Occurrence

6210' from the base of the section, Greenock formation.

Composita subquadrata (Hall)

Plate 8 figs. 8, 9

1858 Athyris subquadrata Hall, Geol. Iowa, Vol. 1
Pt. 2, p. 703, Pl. 27, figs. 2a-d
p. 708, fig. 118

1914 Composita subquadrata Weller, Illinois State Geol.
Surv., Mon. 1, Vol. 1, p. 489, Pl. 91, figs. 1-15

Remarks - #39001

One complete pedicle valve and numerous flattened specimens are referred to C. subquadrata. The larger specimens have a length of 26 mm. and width of 22 mm. and a wide flat sinus developed anteriorly.

Occurrence

5092' from the base of the Section, Greenock formation.

Genus, EUMETRIA Hall, 1895

Eumetria cf. vera (Hall)

Plate 8 fig. 28

1858 Retzia vera Hall, Geol. Iowa, Vol. 1, Pet. 2
p. 704, Pl. 27, fig. 30

1914 Eumetria vera Weller, Mon. 1, Illinois State
Geol. Surv., Vol. 1, p. 44, Pl. 76,
figs. 13-17

Remarks- #39066

One large, incomplete specimen is approximately 30 mm. in length and 26 mm. in width. The beak is slightly incurved

and contains a large circular foramen $2\frac{1}{2}$ mm. in diameter. Thirty-eight low, rounded costae are present on the brachial valve, similar costae are present on the pedicle valve, but not well enough preserved to be counted.

This form is larger and more subovate than E. vera as described by Weller.

Occurrence

6210 from base of Section, Jackfish R., Greenock formation.

Phylum MOLLUSCA

Class GASTROPODA

Genus, PLATYCERUS Conrad, 1840

Platyceras sp. indet.

Description - #39029

One small specimen about 12 mm. in overall length from the outer lip of the oval aperture to the first whorl, dextral surface wider and flatter than the sinistral, dorsum between the two surfaces angular, shell ornamented by fine numerous sinuous growth lines.

Remarks

This specimen resembles Platyceras, Form E, described by Girty (1899).

Occurrence

2732' from the base of section, Jackfish R., Rundle formation.

Class, PELECYPODA

Genus, GRAMMYSIA DeVerneuil, 1847

Grammysia sp. indet.

Description - #39051

One specimen shows the left valve; valve subovate in outline, length 19 mm., height 16 mm.; beak anterior to midlength; ventral margin rounded, continuation of the anterior margin; posterior margin obliquely truncate, but rounded into the ventral margin; umbo prominent, rounded to the anterior, abrupt and sharply defined dorsally but extended as a rounded ridge posterolaterally; auricle straight and cut obliquely by the posterior margin; surface, except for the auricle, ornamented with concentric low, rounded wrinkles which broaden from the beak ventrally and merge at the umbonal ridge to form low broader concentric bands.

Occurrence

1654' from the base of the section, Jackfish R., Banff formation.

Genus, PALEONEILO Hall, 1867

Palaeoneilo sp. indet.

Description - #39041

Several small specimens 10 mm. in length, 8 mm. in height are subtrigonal in outline; beak subanterior; anterior margin rounded into the ventral margin; posterior

margin extended and subrounded; postumbonal outline straight to slightly convex with a slight depression running parallel to the margin; shell thick, ornamented by concentric growth lines.

Remarks

These specimens resemble P. bedfordensis Week (Hyde, 1953) but evidence is not complete enough from these few specimens to attempt a specific identification.

Occurrence

1318' to 1357' from base of the section, Jackfish R., Banff Shale, First fossils collected above the basal sandstone of the section.

Phylum ARTHROPODA

Class, TRILOBITA

Genus, PROETUS Steininger 1831

Proetus loganensis Hall & Whitfield

1877 Proetus loganensis Hall and Whitfield,
King's U.S. Geol. Expl. 40th Par. Vol. 4,
p. 264, Pl. IV, fig. 37

1899 Proetus loganensis Girty, U.S. Geol. Surv.
Mon. 32, Pt. 2, Chap. 12, sec. 2, p. 577
Pl. 71, fig. 15a

Remarks - #39053, #39007

Several pygidiums, length 8 mm., width 12 mm.
compare favourably with those described by Girty and by Hall and Whitfield.

Occurrence

1518' to 2258' from the base of the section,
Jackfish R., Banff and Rundle formations.

Phylum ECHINODERMATA

Class BLASTOIDEA

Genus, PENTREMITES Say, 1820

Pentremites sp.

Description - #39091

Body of medium size, ovoid, length 21 mm., greatest width 12 mm. below midlength at the base of the ambulacral areas, base one-quarter the total length, ambulacral areas slightly less than three-quarters of the length.

Summit not well preserved, not more than 5 mm. in diameter; base conical, sides divergent at 45° ; radial plates 13 mm. in length, sloping laterally to form a depression or concave junction with the adjacent radials, a sharp ridge occurs below the ambulacral areas; ambulacral areas concave; greatest width at the summit, sides sharply defined, narrowing gradually towards the base, subparallel for about one-half of their length. Ambulacral grooves slope gently towards the base, approximately 10 grooves in 5 mm.

Deltoid plates 5 mm. in length, $2\frac{1}{2}$ mm. in width, 1 mm. from the bottom of the plate.

Remarks

Specimens were collected from rubble believed to

be about 2500 feet from the base of the section, Rundle formation.

PLANT KINGDOM

Phylum PTERIDOPHYTA

Class, LYCOPODIALES

Genus, LEPIDODENDRON Sternberg, 1820

Lepidodendron sp. A

Plate 9 fig. 3

Description - #39059

The leaf cushions on a portion of a stem preserved as a sandstone cast are 10 mm. in length and 5 mm. in width. The cushions are not rhomboid but lens like. The top and bottom extremities are attenuated while the sides at the greatest width are rounded.

Occurrence

3957' - 5750', Greenock formation.

Lepidodendron sp. B

Plate 9 fig. 2

Description - #39059

Leaf cushions of this specimen are preserved as an imprint in sandstone. The cushions which are closely packed are distinctly rhomboid, 5 mm. in length, 4 mm. in width with the lateral and vertical extremities angular.

Occurrence

5750', Greenock formation .

Genus, STIGMARIA Brongniart, 1822
Stigmara sp.

Plate 9 fig. 1

Remarks - #39056

A Stigmarian branch preserved as a sandstone cast measures 10 3/4 inches in circumference. The root scars are quincuncially arranged generally but this pattern is broken up in one portion of the branch by smaller root scars of no set pattern. The central vascular cylinder is preserved as a small ovoid structure 10 mm. in diameter.

Occurrence

3900' from the base of the section, Greenock formation.

Photographic Views
of
Jackfish River Section

MISSISSIPPIAN SECTION JACKFISH RIVER,
NORTHWEST TERRITORIES



Fig.1 Lower part of section, soft black fissile shale, grading upwards into cyclic calcareous shale, and argillaceous limestone



Fig.2 Higher up in the section, showing more massive beds of limestone interbedded with calcareous shale.

MISSISSIPPIAN SECTION JACKFISH RIVER
NORTHWEST TERRITORIES



Fig.1 Massive sandstone interbedded with thin beds of carbonaceous shale and thin coal seams.



Fig.2 Massive sandstone forming the uppermost part of the section.

Fossil Illustrations

and

Descriptions

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PLATE 1

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PLATE 1



1



2



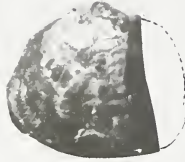
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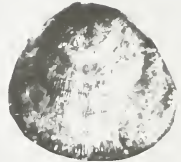
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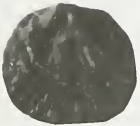
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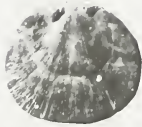
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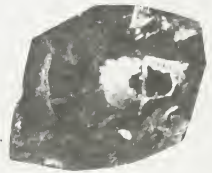
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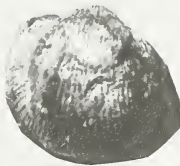
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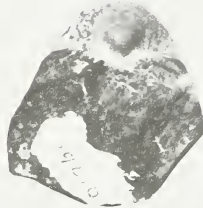
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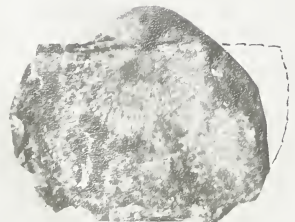
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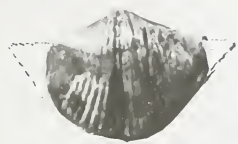


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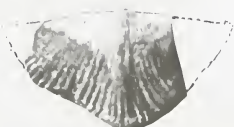
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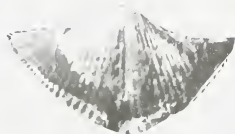
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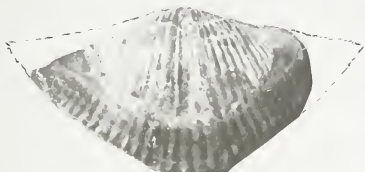
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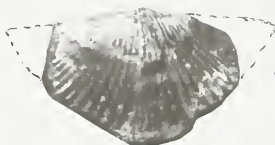
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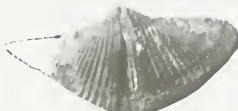
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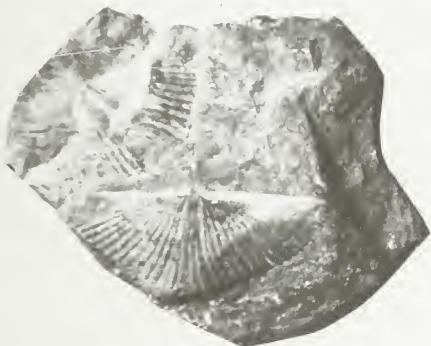
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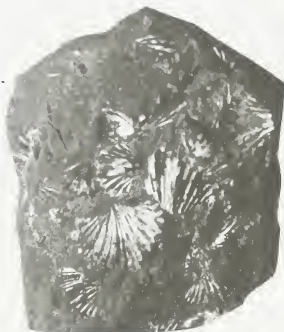
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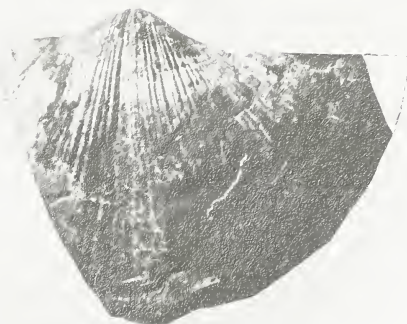
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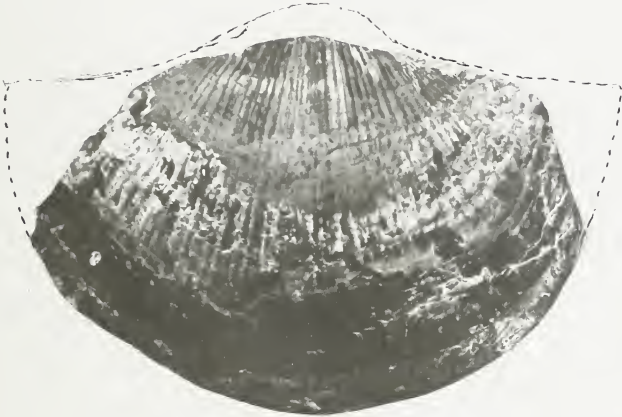
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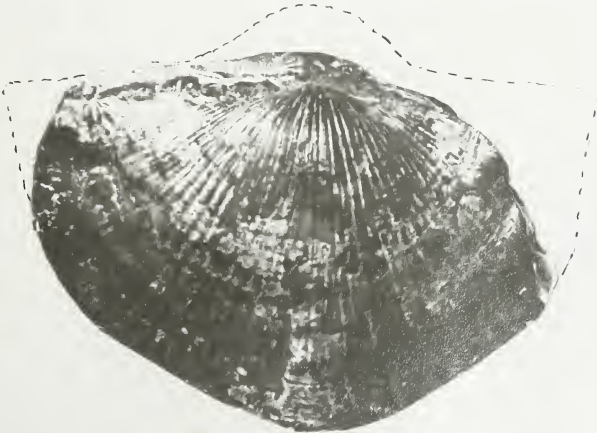
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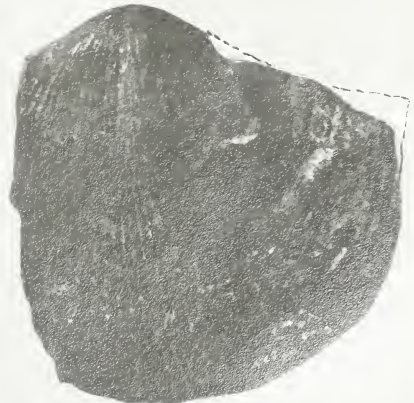
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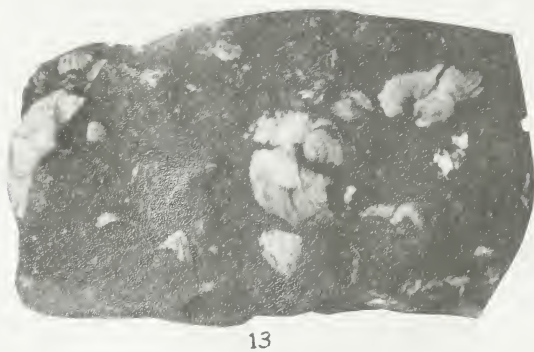
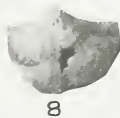
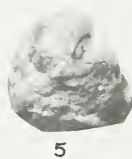
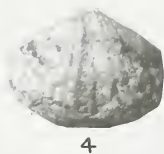
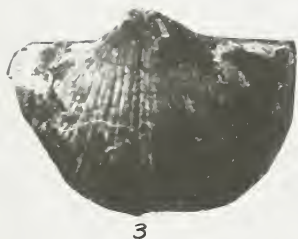
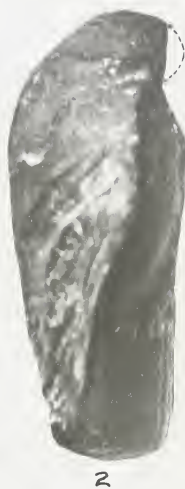
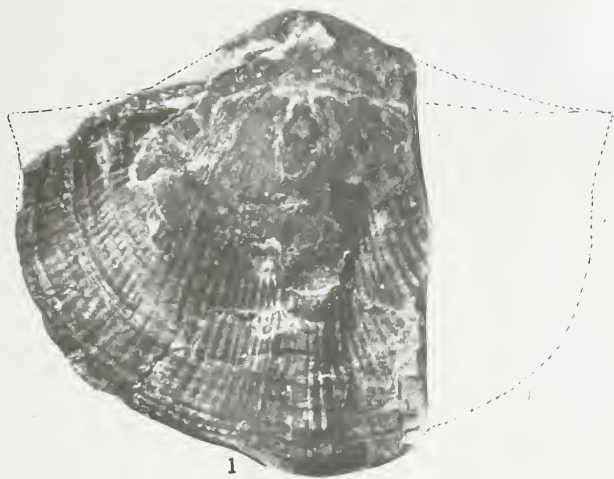


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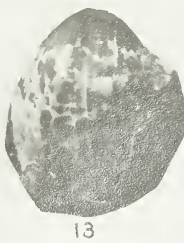
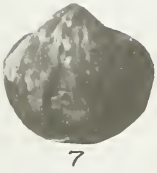
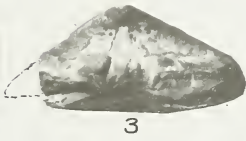
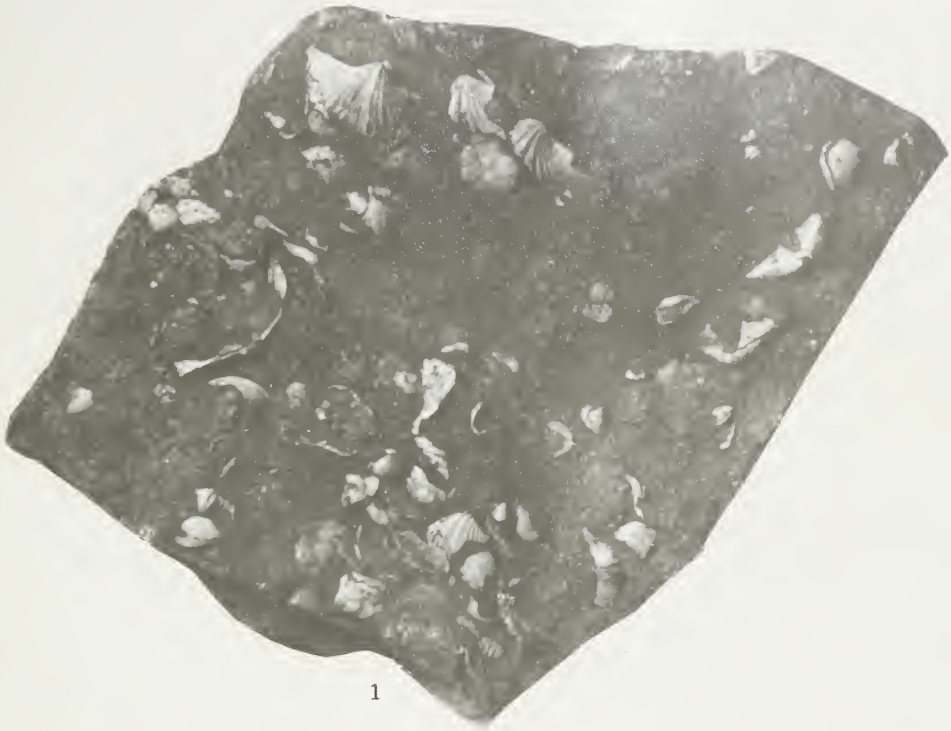
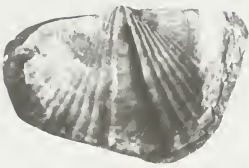


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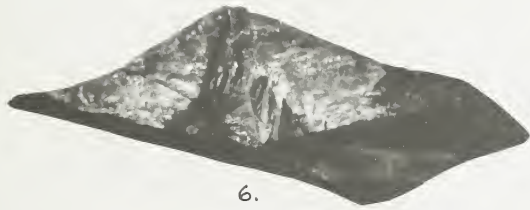
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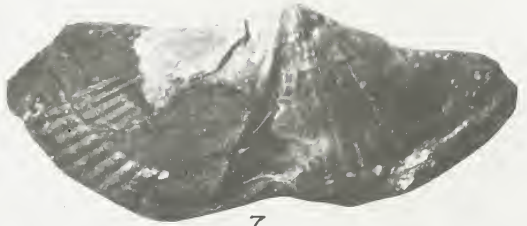
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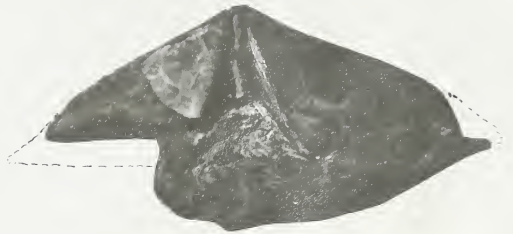
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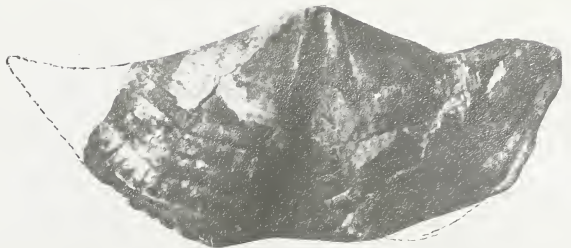
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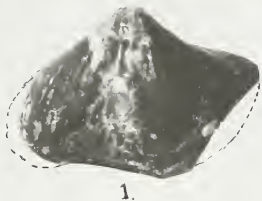


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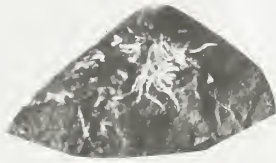
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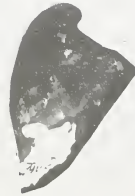
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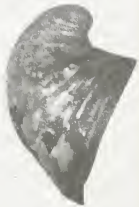
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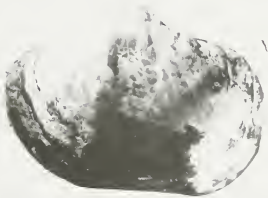
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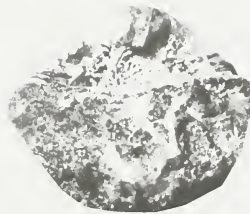
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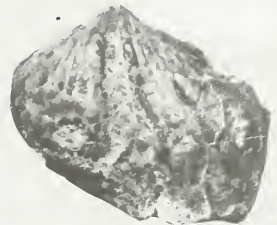
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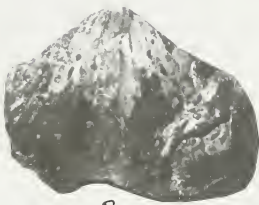
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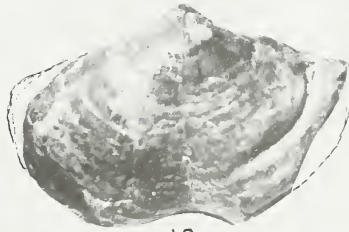
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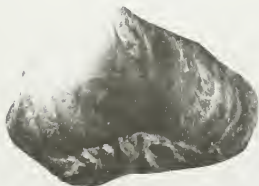
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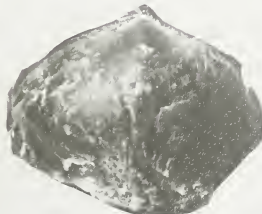
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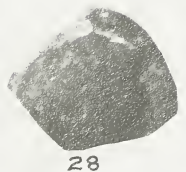
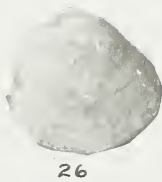
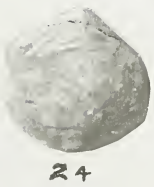
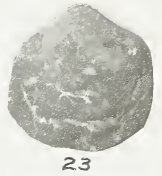
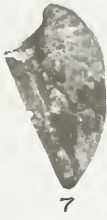
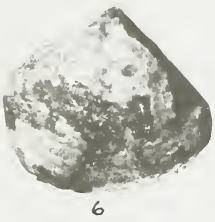
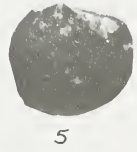
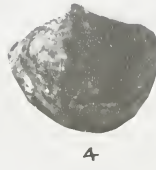
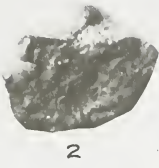
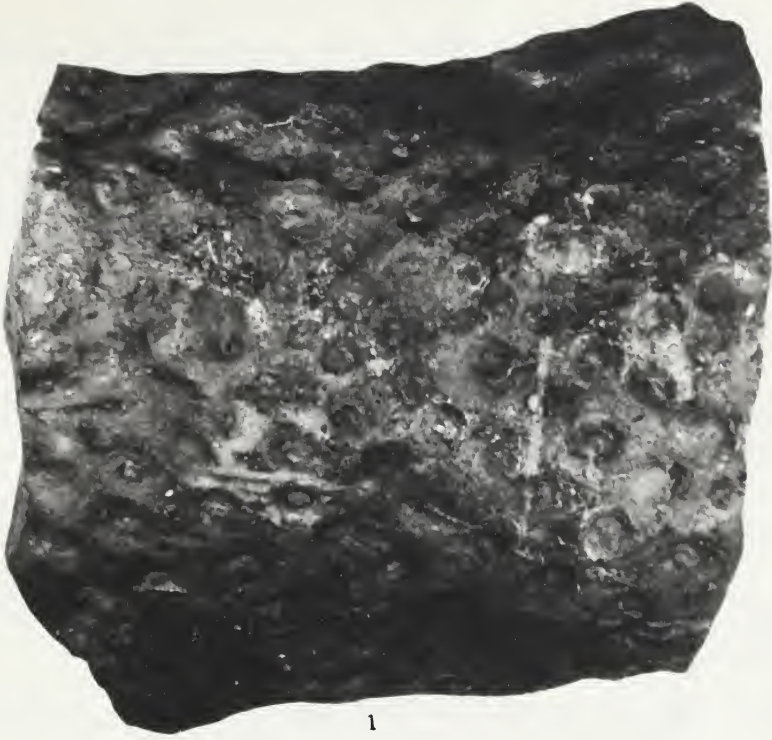


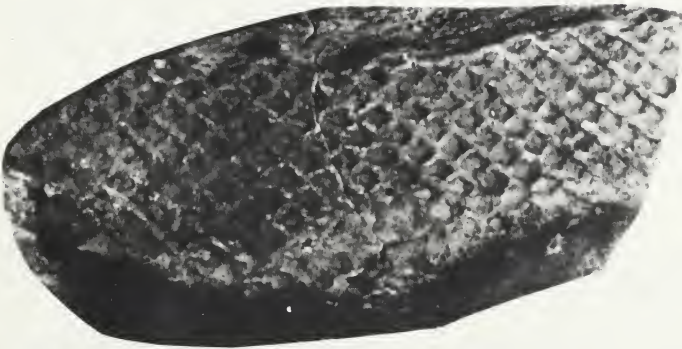
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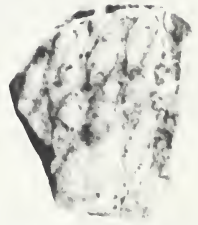
PLATE 9



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APPENDIX

Footage	Catalogue Number	Fauna or Flora
200	#39079	<u>Chonetes</u> sp. indet. <u>Crinoid</u> columnals
300 to 500	39081	Plant remains
1318	39041	<u>Paleoneilo</u> sp. indet.
1357	39005	<u>Paleoneilo</u> sp. indet.
1383	39004	<u>Chonetes geniculatus</u> White
1460	39003	<u>Chonetes illinoisensis</u> Worthen
1513	39008	<u>Platyrachella rutherfordi</u> (Warren)
1518	39007	<u>Spirifer</u> cf. <u>marionensis</u> Shumard <u>Spirifer rowleyi</u> Weller <u>Spirifer centronatus</u> Winchell <u>Spirifer</u> cf. <u>grimesi</u> Hall <u>Spirifer striatiformis</u> Meek <u>Punctospirifer solidirostris</u> (White) <u>Rhipidomella missouriensis</u> (Swallow) <u>Tornyeria cooperensis</u> (Swallow) <u>Cleiothyridina obmaxima</u> (McChesney) <u>Proetus loganensis</u> Hall <u>Pseudosyrinx</u> sp. <u>Dictyoclostus</u> cf. <u>arcuatus</u> (Hall) <u>Camarotoechia allani</u> Warren
1559	39048	<u>Spirifer centronatus</u> Winchell
1564	39002	<u>Platyrachella rutherfordi</u> (Warren) <u>Spirifer</u> cf. <u>marionensis</u> Shumard <u>Spirifer rowleyi</u> Weller <u>Rhipidomella missouriensis</u> (Swallow) <u>Brachythyris</u> cf. <u>chouteauensis</u> Weller <u>Schizophoria</u> sp. indet. <u>Dictyoclostus</u> cf. <u>arcuatus</u> Hall <u>Pseudosyrinx</u> sp.
1588	39006	<u>Punctospirifer solidirostris</u> (White) <u>Brachythyris</u> cf. <u>chouteauensis</u> Weller <u>Spirifer rowleyi</u> Hall
1654	39051	<u>Grammysia</u> sp.
1663	39025	<u>Fenestrellina</u> sp.

Footage	Catalogue Number	Fauna or Flora
1685	#39011) 39020) 39050)	<u>Spirifer cascadensis</u> Warren <u>Spirifer</u> sp. cf. <u>Diphyphyllum</u> <u>Cleiothyridina</u> lata Shimer <u>Caninia</u> sp. <u>Syringopora</u> cf. <u>surcularia</u> Girty <u>Spirifer grimesi</u> Hall
1690	39017	<u>Caninophyllum</u> sp. <u>Neozaphrentis</u> sp.
1760	39026	<u>Sulcoretepora</u> sp. <u>Rhombopora</u> sp. <u>Fenestrellina</u> sp.
1798	39033	<u>Schuchertella</u> ? <u>Schellwienella</u> ?
1803	39035	<u>Spirifer centronatus</u> Winchell <u>Sulcoretepora</u> sp. <u>Fenestrellina</u> sp. <u>Rhombopora</u> sp.
1809	39024	<u>Spirifer centronatus</u> var. <u>minnewankensis</u> Shimer
1829	39031	<u>Marginirugus</u> sp. indet.
1833	39028	<u>Spirifer albertensis</u> Warren
1853	39019	<u>Spirifer grimesi</u> Hall
1863	39015	<u>Cleiothyridina obmaxima</u> (McChesney) <u>Schellwienella</u> ? sp. <u>Spirifer grimesi</u> Hall
1873	39013	<u>Spirifer centronatus</u> Winchell <u>Spirifer centronatus</u> var. <u>minnewank-</u> <u>ensis</u> Shimer
1895	39010	<u>Spirifer centronatus</u> Winchell <u>Brachythyris chouteauensis</u> Weller <u>Brachythyris</u> sp. <u>Dictyoclostus</u> cf. <u>jasperensis</u> (Warren) <u>Rhipidomella</u> sp. <u>Schellwienella</u> sp. indet. <u>Dictyoclostus</u> sp. indet.
1928	39032	<u>Spirifer centronatus</u> Winchell <u>Rhipidomella</u> cf. <u>diminutiva</u> Rowley
1958	39016	<u>Spirifer centronatus</u> Winchell <u>Pustula</u> sp. indet.

Footage	Catalogue Number	Fauna or Flora
1963	#39014	<u>Platyrachella</u> cf. <u>rutherfordi</u> (Warren) <u>Spirifer</u> <u>centronatus</u> Winchell <u>Cleiothyridina</u> <u>lata</u> Shimer <u>Torynifer</u> <u>pseudolineata</u> (Hall) <u>Spiriferella</u> cf. <u>minnewankensis</u> Shimer <u>Spiriferella</u> sp.
1978	39044	<u>Brachythyris</u> sp.
2158	39053	<u>Proetus</u> <u>loganensis</u>
2198	39034	<u>Torynifer</u> sp.
2258	39022	<u>Schellwienella</u> ?
2278	39021	<u>Fenestrellina</u> sp.
2498	39042	<u>Polypora</u> sp. <u>Triplophyllites</u>
2500	39091	<u>Pentremites</u> sp. <u>Fenestrellina</u> sp. <u>Rhombopora</u> sp.
2518	39018	<u>Triplophyllites</u> sp.
2558	39037	<u>Composita</u> cf. <u>immatura</u> (Girty)
2580	39012	<u>Spirifer</u> <u>bifurcatus</u> Hall <u>Platyrachella</u> <u>rutherfordi</u> (Warren) <u>Spiriferella</u> <u>minnewankensis</u> Shimer
2630	39009	<u>Spirifer</u> sp. <u>Brachythyris</u> cf. <u>suborbicularis</u> Hall
2732	39029	<u>Platyceras</u> sp. <u>Triplophyllites</u> sp.
3900	39056	<u>Stigmaria</u> sp.
3957	39057	<u>Lepidodendron</u> sp.
5060	39000	<u>Spirifer</u> cf. <u>nellaensis</u> Weller <u>Composita</u> sp. A <u>Composita</u> sp. B
5092	39001	<u>Composita</u> <u>subquadrata</u> Hall
5750	39059	<u>Lepidodendron</u> sp.
5760	39058	<u>Lepidodendron</u> sp.

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